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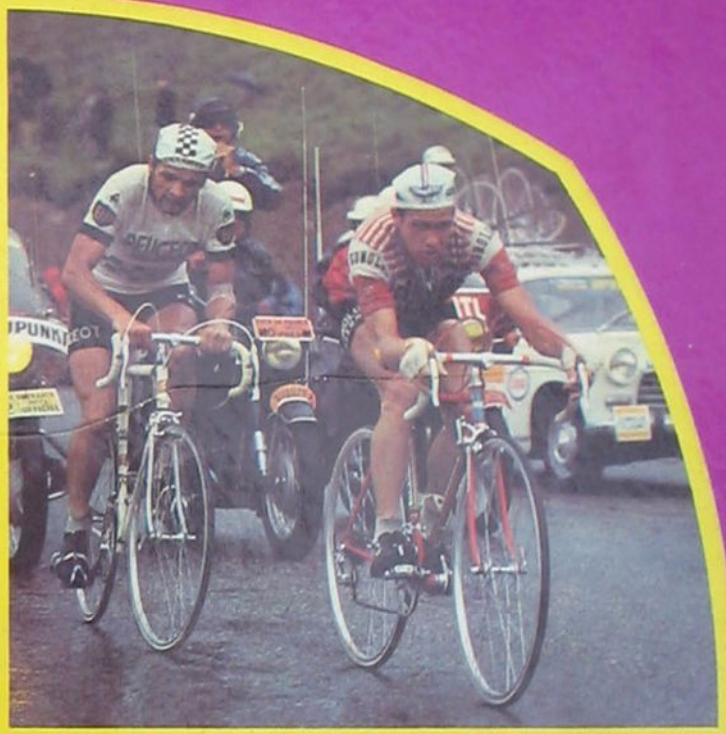

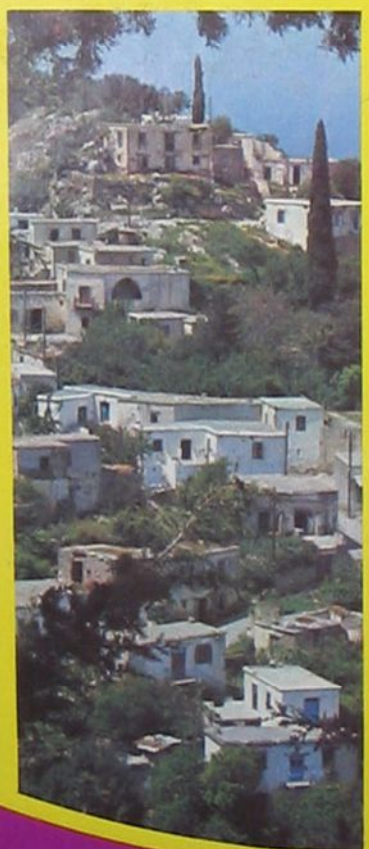

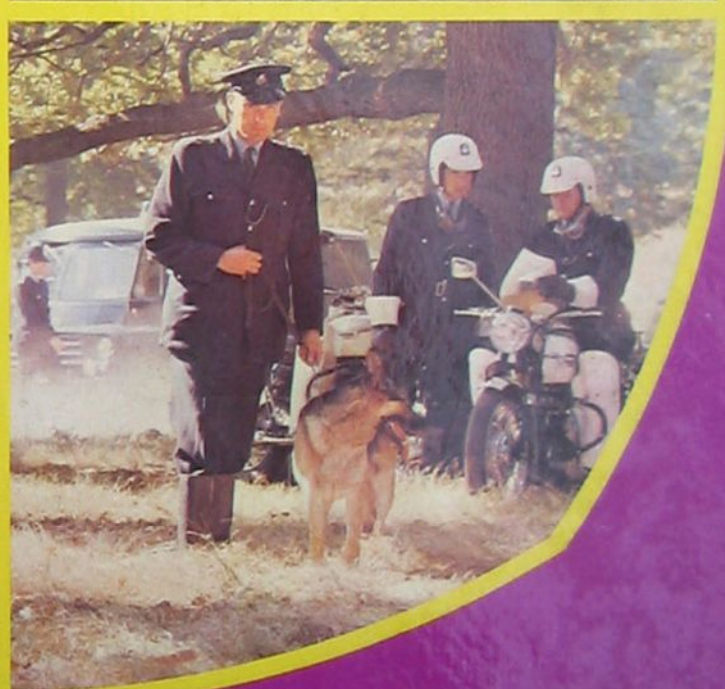

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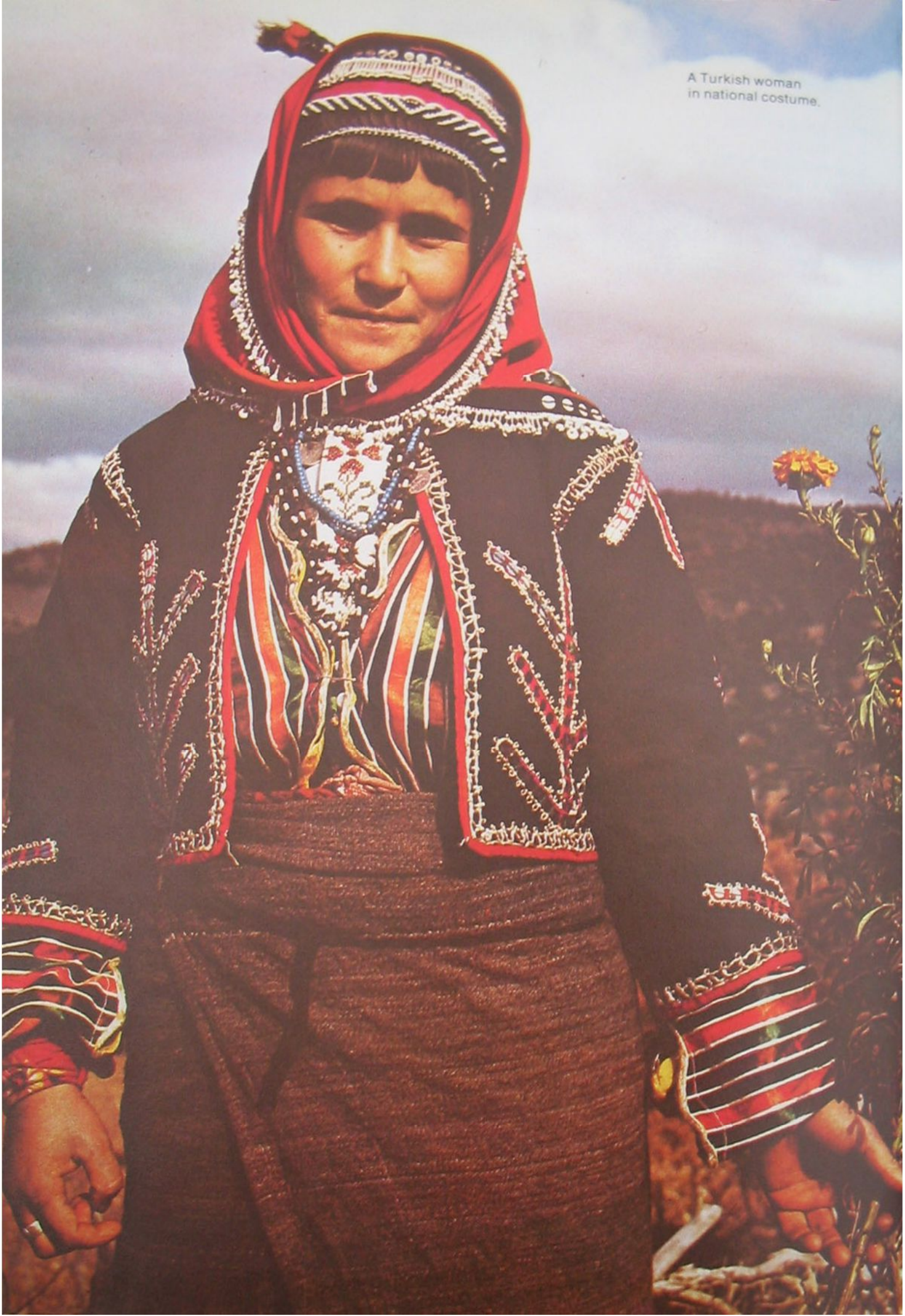


A Turkish woman
in national costume.

Corrosion Most metals left unprotected in the atmosphere or in the ground are gradually attacked and 'eaten away' by substances such as oxygen and acids. This process is called *corrosion*.

The rusting of iron and steel is one of the commonest forms of corrosion. When iron is left out in the rain, it soon becomes covered with a reddish-brown layer of rust. After a while, the layer flakes off and more rust forms. The metal gradually gets eaten away.

Rusting is caused by oxygen in the air attacking the iron in the presence of moisture to form an oxide film—rust. Neither oxygen nor water by themselves will cause rusting. In some metals, the oxide layer does not flake off but forms an intact film which protects the metal from further attack. Aluminium and chromium form such a layer and therefore do not corrode like iron does.

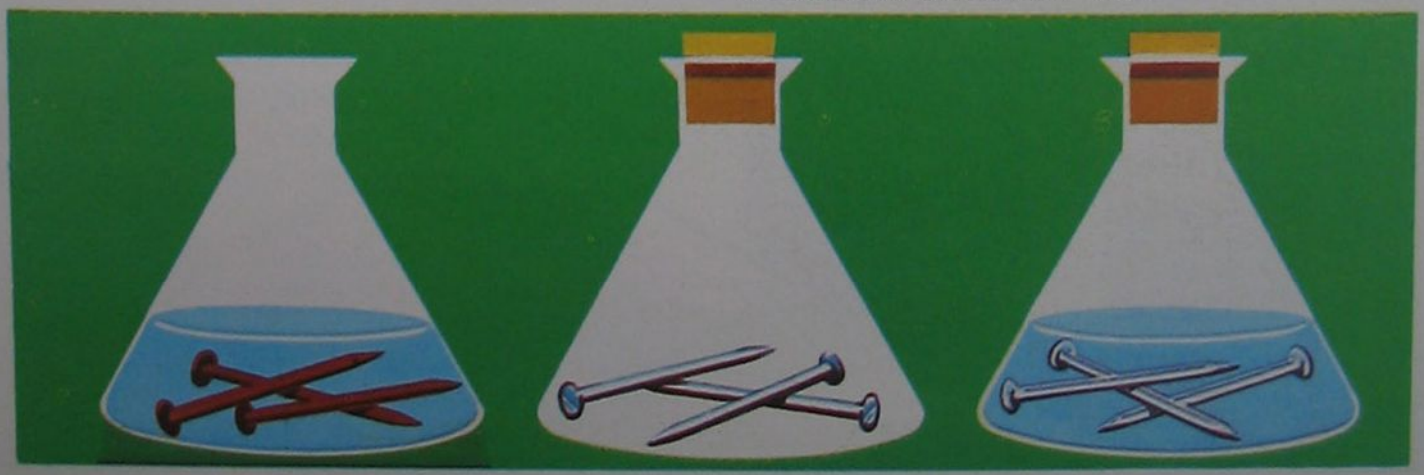
Another familiar form of corrosion is the tarnishing of silver. The tarnish is a layer of silver sulphide formed by the attack of hydrogen sulphide in the atmosphere. The bluish-green verdigris on copper and bronze also results from corrosion.

Often a metal corrodes away without any kind of layer being formed. This happens because the wet surface of a metal behaves like many tiny electric cells, or batteries. In a battery an electric current flows between two metals in a solution called the *electrolyte*. One of the metals (the *cathode*) gradually gets eaten away as current flows to the other (the *anode*). A similar thing happens in corrosion. Electric cells form between the metal and impurities or other metals present. And metal gradually dissolves away. This is called *electrolytic corrosion*. It is worse when the moisture present contains chemicals such as salt.

There are two main ways of protecting a metal structure from corrosion. One is to use a metal which does not corrode, such as stainless steel. The other is to use a metal or an alloy which does corrode and cover the surface in some way.

Most stainless metals, such as tin, chromium, and zinc, are not suitable for

Left: Extensive use is made of protective coatings of zinc in the manufacture of motor cars. This process is called galvanizing. Right: application of the zinc by means of spraying is one of the most convenient methods of galvanizing steel. Below: Both oxygen and water are necessary for corrosion. Some nails sealed in a flask of dry air (centre) or placed in boiled water sealed from the air (right) will not rust. But if the nails are kept under water in an open flask (left) they will rust.



structures anyway. Stainless steel and other stainless alloys tend to be too expensive to use on a large scale. It is much cheaper to use ordinary steel and coat it either with a layer of tin, chromium, nickel, or zinc, or simply with paint. Red lead paint has long been used to protect structures such as bridges.

The steel may be coated by electroplating or by dipping in molten metal. The tinplate used for our tin cans is made from sheet steel plated with tin. Chromium-plated automobile parts have layers of first nickel and then chromium on a steel base. Coating with zinc is called *galvanizing*.

Zinc protects steel because in the electric cell formed between the metals, it is the zinc which gradually dissolves away. The action of zinc is called *cathodic*, or *sacrificial protection*.

Corsica, a department of France, is a Mediterranean island lying to the west of Italy and due north of Sardinia. Its area is 3,370 square miles, and its population is 270,000. Ajaccio is the capital.

Corsica is a wildly mountainous island, with no rivers. The typical *maquis* vegetation, consisting mainly of tangled shrubs, flourishes in the semi-tropical climate. Farmers rear large numbers of sheep and goats, and the main crops are chestnuts, vines, olives and citrus fruits. Tourism is on the increase.

The island is noted for being the birthplace of Napoleon Bonaparte.

Cortes, Hernando (1485-1547), a Spanish soldier, conquered the rich land of Mexico for Spain.

In 1511 Cortes helped in the conquest of Cuba. Seven years later the governor of Cuba put Cortes in command of a small fleet and an army of about 650 men, and sent him to the mainland to look for treasure. Cortes led his expedition along the coast of Yucatan and, in 1519, landed on the coast of Mexico. There he founded the settlement of Veracruz.

Cortes then turned against the governor of Cuba, declaring his loyalty to the king of Spain alone. Leaving a small force to guard Veracruz, Cortes marched overland to Tenochtitlan (now Mexico City), the capital of the Aztec Indians. Montezuma, the Aztec ruler, at first thought Cortes was a god. But the Spaniard made Montezuma a prisoner and attempted to govern the country through him.

The Aztecs rebelled and attacked Cortes

Cortes was one of the first Europeans to reach the Pacific Ocean, during his first expedition in 1519. He made a journey around the Yucatan Peninsula from 1524 to 1526 and in 1535, he explored the Pacific coast and founded a settlement in California.

and his men in Tenochtitlan. Although the Spaniards had better weapons and killed many thousands of Aztecs, they were so greatly outnumbered that eventually they had to give up the city. Cortes and his small army were chased to the plain of Otumba. There, on the 7th July, 1520, they fought and won a great battle against the pursuing Aztecs. The following year, with a reinforced army, Cortes recaptured Tenochtitlan, thus conquering Mexico for Spain. He later continued to extend Spanish control over the country.

Cortes eventually lost favour with the king of Spain, and in 1540 he returned home in disgrace. He died seven years later near Seville.

Cosmetics are preparations used to cleanse or beautify the body. They include oils, creams, lotions, perfumes, powders and dyes. Common cosmetics are face creams and lipstick, used by women; and aftershave, used by men.

The Egyptians were among the earliest users of cosmetics. They made up their eyes heavily with bright pigments and with *kohl*, a black mineral substance. They reddened their feet, hands and hair with *henna*. The Romans, who also used many cosmetics, lightened their hair and made their faces white with chalk and lead. After bathing, they rubbed perfumed oils into their skin.

The Crusaders reintroduced cosmetics to Europe from Asia in the Middle Ages. Such adornment suited the age of chivalry. Cosmetic use reached a height in the 1700's, especially in the courts of France and Italy. Hair powders, milk baths and lipstick were among the preparations most commonly used.

The word cosmetics comes from the Greek word meaning 'skilled in decorating'. Through the ages many unlikely substances have been used to enhance the appearance. Men of the European tribes of the Dark Ages put rancid butter on their hair. The ladies of the 1700's used face cream with a poisonous lead base. Arsenic, soot, vinegar and eggs have also been used as cosmetics.

Top: An ancient Egyptian cosmetic box and mirror. The Egyptians used make-up to protect their faces from the fierce sun as well as for decoration.
Above: The picture on the left shows the girl before she has been made up. On the right she is wearing cosmetics, including protective creams and colourings.

Costa Rica is a Spanish-speaking country of Central America. It lies between Nicaragua and Panama and has an area of 19,238 square miles. Large plains stretch inland from the Caribbean and Pacific coasts, separated by soaring mountains and high plateaus. Most of the population of 1,800,000 are farmers, growing coffee, bananas, cocoa and sugar cane. The people are almost all *mestizos,* of mixed European and Indian descent, or are descended

Location map of Costa Rica.

Facts and Figures
Area: 19,238 square miles.
Population: 1,800,000.
Capital: San José.

COSTUME THROUGH THE AGES

Egyptian Queen's Robes

Greek Chiton

Roman Toga

Italy
Middle Ages

Holland
15th Century

England
16th Century

Austria
17th Century

France
18th Century

France
1860s

France
1914

United States
1930

France
1947

England
1967

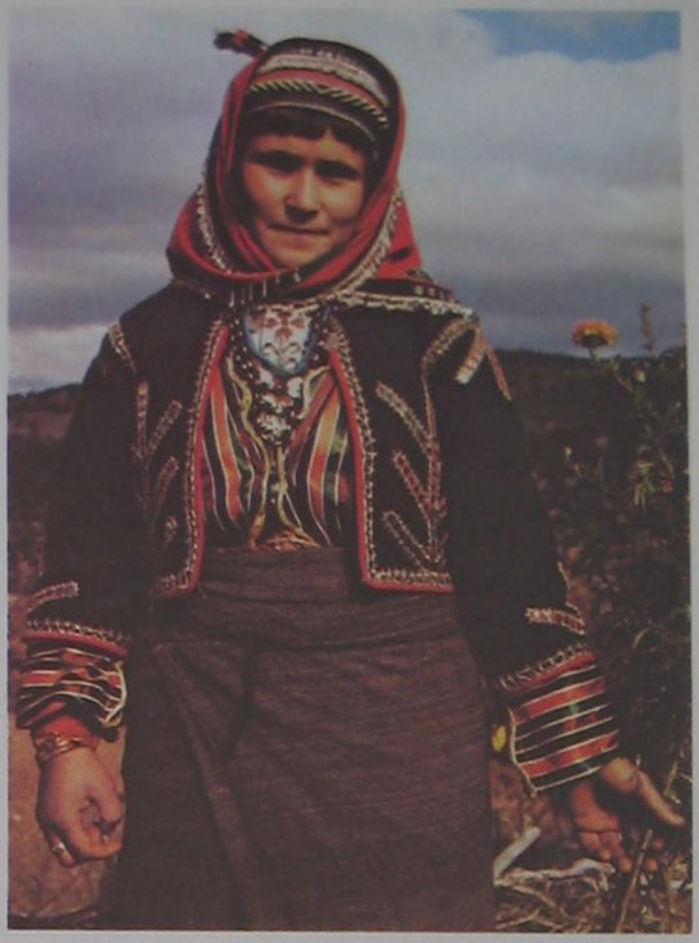
from the first Spanish settlers. Costa Rica was discovered by Christopher Columbus in 1502 and was a Spanish colony until 1812. It became fully independent in 1844.

Costume The main purpose of clothing is to protect people from the climate which dominates their lives. Mainly, this means protection from cold, because most people live in areas that would be uncomfortably cold without clothes for some of the time.

Clothing also protects people against heat, rain, snow and dust. For example, tropical farmers, although scantily clad, often wear large hats to protect them against both sun and rain. The flowing robes of the Sahara's wandering Arabs not only give protection against the burning sun of the day and the chilling cold of night, but also against the sudden merciless dust storms. These would flay the skin of any desert-dweller foolish enough not to protect his whole body by clothing.

Although about half of the world's people now wear Western dress, there is much variation in the clothing worn by other people. Apart from climatic reasons, variations exist from place to place according to what materials are available, to habit and customs and to fashion. The central Asian herdsman wears leather or wool from his animals. The Indian woman who migrates to a cold climate may still wear her silk sari rather than a woollen dress. Most Muslim women wear long robes and veils because custom decrees that their faces, hair, arms and legs should be hidden from the sight of strange men. In the early 1970's, mini-skirted girls prefer to suffer cold in winter rather than to be out of fashion.

Some people wear special clothing that shows their rank or job. On state occasions British noblemen wear fur-trimmed robes and coronets, the amount of fur and the design of the coronet showing their exact rank. Many clergymen wear special



A Turkish woman wearing her national costume of a colourfully embroidered waistcoat and a white head scarf. In many countries the national costume is now the equivalent of 'Sunday best' and is only worn on festivals or holidays.

collars. Uniforms mean that people like policemen and traffic wardens can easily be recognized, which helps them to do their jobs. The policeman's tall helmet was designed to protect his head if he was attacked; in the same way the fireman's helmet and heavy boots keep him from harm. People like welders, divers and astronauts also wear specialized protective clothing, without which they might suffer injury or death.

Man-made fibres can be made into clothes that are warm and practical, light and easy to clean. But for special occasions, many people still turn back to their traditional regional or national dress. The clothes of Balkan women are renowned for their colourful embroidery, while in parts of France women wear elaborate lace headdresses. Men too have traditional clothes, like the Cretans who wear kneeboots

and baggy blue breeches, with a sash round their waists, while round their heads they wind fringed scarves.

Talking Points

*Do you think that it is more important that clothes should be fashionable and attractive, or hard-wearing and practical?

*Find a book containing illustrations of the national costumes of different countries. Discuss why you think that these costumes came into use. Remember that climate and raw materials have an influence on what people wear.

*Examine the clothes that you are wearing and write down all the different materials that they are made of.

Articles to read

Cotton; Dyes; Embroidery; Fibres; Furs; Lace; Leather; Nylon; Uniform.

Below: A cotton boll. Top right: Lorries arrive at the ginnery laden with bolls. Centre right: The interior of a cotton mill, showing the cotton fibre before spinning. Bottom right: Reels of cotton thread are woven into cloth in a factory.

Cotton is one of the most important plants to man. For the last 5,000 years, man has been making cloth from cotton fibres. Cotton cloth is used for clothing more than any other material. But cotton is not only used for clothing. The cotton fibres used for cloth are also used to make sheets and blankets, carpets, towels, umbrellas, and twine. The other parts of the cotton plant are useful. The *linters* are short fibres unsuitable for cloth. But they can be used to make cottonwool, paper, rayon, plastics, and even explosives. Cotton seeds yield a valuable oil used to make cosmetics, linoleum, paints, and soap, among many other products. The seeds also make good cattle food.

Photo: Sonia Halliday

Cotton bolls being picked by hand in Turkey. In the more industrialized parts of the world cotton is picked by machine but elsewhere traditional methods are still used.

The cotton plant is related to the hollyhock. Although some wild species are perennials, cultivated cotton plants are annuals. They are dug up at the end of the season and seeds are planted at the start of the next season. During the summer, fruits called *bolls* develop from the flowers. The bolls are round and green and contain seeds. When they are ripe, the bolls split open to reveal a mass of seeds covered in fibres. These are made of cellulose, and are usually white in colour. The fibres catch in the wind and help to scatter the seeds, but the bolls are harvested before this happens. In some countries the harvesting is done by hand, and is back-breaking work. But machines are used in many countries.

The bolls are then taken to a *gin*, a machine that removes the fibres from the seeds. The fibres are pressed into bales ready for sale to cotton mills. In the mill, the fibres are cleaned and then spun into yarn. In this process, the cotton is combed to straighten the fibres, and then they are

twisted together to make yarn. Several yarns are wound into a thread, and the thread is woven into cloth.

Cotton plants grow in well-watered soils in hot regions. The southern United States produces the most cotton. Other leading cotton-producing countries include Russia, India, Brazil and Egypt. Farmers have to protect their plants from insect pests, such as the boll weevil, thrips, and aphids or greenflies, by treating them with insecticides.

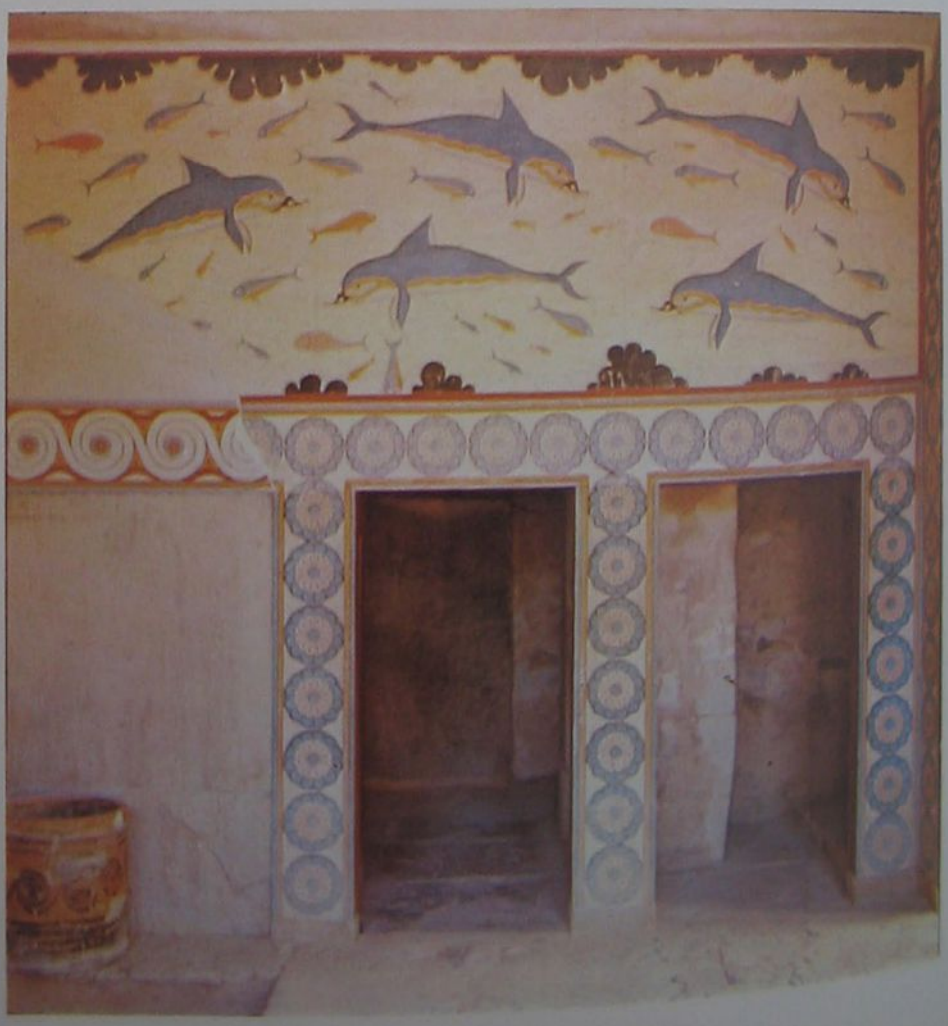
Crete is an island in the Mediterranean Sea. It is part of Greece, but lies about 80 miles south-east of the Greek mainland. About 483,000 people live on Crete, which covers an area of 3,219 square miles. Its chief towns are Iraklion (Candia) and Khania (Canea). It is a long, narrow island, with mountains along it, running from east to west. The mountains slope steeply to the sea in the south, but slope more gently to the north.

Fertile plains lie around the coast and between the mountains. The mountains rise to more than 8,000 feet. Rain falls mostly in the winter. In the hills it lies as snow. In summer, the hot sun often dries up rivers and streams.

Crete is an isolated island, and the people have to work hard to make a living. Farmers rear sheep and goats, and grow grapes, almonds, olive trees, oranges, lemons and grapefruit. Forests used to grow on the hillsides, but now much of the land is barren and uncultivated.

By 3000 B.C., the inhabitants of Crete had reached a Stone Age level of culture. But after that time Crete began to develop rapidly. By 2000 B.C., it was a highly civilized place, with thriving towns, potteries and metal industries. The Cretans also developed a form of picture writing, similar to that of Ancient Egypt. From that they evolved an alphabet – the earliest-known writing in Europe.

The civilization that followed is often called Minoan after a legendary king of Crete called Minos. Ruins of great Minoan



A painted fresco showing dolphins in the queen's room in the palace of Knossos in Crete. The Minoan civilization flourished in the 2nd millennium B.C. Minoan works of art were very advanced for their time and have had considerable influence on European art in much later periods. The dolphin was thought to be a sacred animal and ancient sailors thought that it brought good luck.

palaces at Knossos and elsewhere have been found.

After 1400 B.C., Cretan civilization declined. The Romans conquered the island in 67 B.C. During the next 1,700 years, it was held by Byzantines, Arabs and Venetians. The Turks seized it from the Venetians in 1669, and held it for 200 years. The Turks left the island in 1898, following a war with Greece. Crete became part of Greece in 1908. The Germans occupied Crete from 1941 to 1945, during World War II.

Above: An illustration of a cricket match taking place on the 'celebrated cricket field near White Conduit House' in 1787. Below: Sir Donald Bradman, perhaps the greatest of all Australian batsmen.

Cricket is a bat and ball team game with elaborate laws and traditions, certainly played in England before the end of the sixteenth century and now popular throughout the Commonwealth and in several other countries.

It is played by two teams of eleven-a-side, on a field of unspecified size. Two three-stump wickets, each 9 inches wide and 28 inches high, are set 22 yards apart on a pitch. On the pitch 'creases' are marked with white lines, and these help

The highest number of runs scored by an individual in a test match is 365, made by Garfield Sobers for the West Indies against Pakistan in 1958. The fastest century ever made in a Test match was hit by J. M. Gregory of Australia against South Africa in 1921. He took 70 minutes. Freddy Trueman of England holds the record for the number of test wickets taken by one man. This fast bowler dismissed 307 batsmen between 1952 and 1965. The greatest number of people ever to attend a cricket match was the 350,534 fans who watched England Vs Australia at Melbourne in 1937.

to determine a fair delivery by the bowler, and the successful completion of a run by the batsmen, among other things.

The ball is made of cork and twine encased in leather, weighing between 5½ and 5¾ ounces, with a maximum circumference of 9 inches. The bat consists of a blade, usually of willow, into which is spliced a cane handle. The bat may not be more than four and a half inches at its widest.

Normally each side is allowed two innings which are taken alternately. Two batsmen are on the field at the same time, opposed by all eleven members of the fielding side. Each batsman tries singly to defend his wicket from a bowler's delivery, and to score runs. A run is scored by striking the ball and then running towards the opposite crease, the two batsmen in effect attempting to change places before the fielding side can recover the ball and break the wicket with it. If the fielding side succeed a batsman may be given 'run out', and must be replaced by another member of his team.

Each time the batsmen cross and make their ground in the regulation manner a run is scored. Six runs are scored by hitting the ball full pitch over the boundary, four if the ball touches the ground before crossing the marked boundary line. Extras are added for illegal deliveries ('no balls'), for 'wide balls' and 'byes'. Byes are scored when a batsman makes runs from a ball he has not hit, but which fieldsmen have failed to recover in time. Leg byes are runs scored when the ball passes the wicket after striking the batsman when he is attempting a stroke.

There are several ways in which the batsman can be put out, apart from being run out. The following are some of them: if the ball, passing the bat, hits the wicket or if the batsman plays the ball on to his wicket, he is out 'bowled'; if he hits the wicket himself in making a stroke he can be out 'hit wicket'; and if he hits the ball, and it is caught by a fieldsman before it can touch the ground, he is out 'caught'.

When ten batsmen are out a side's innings is complete, and the teams then reverse roles.

Bowlers bowl in 'overs' of either six or eight balls according to the agreed conditions, and from each end of the pitch alternately, no bowler being allowed two consecutive overs.

One of the fielding side is the wicket-keeper. The remaining nine fieldsmen are disposed about the field at the discretion of the bowler and of the captain of the team.

The side scoring most runs wins the match, providing both sides have completed its agreed number of innings.

The Marylebone Cricket Club, with its headquarters at Lord's in London, is the governing body. It was formed in 1788.

Test matches, which now generally last five days, began in Australia in 1877, the first Test in England taking place at the Oval in 1880. Originally 'Tests' referred only to matches between England and Australia, but the term has now been extended to include matches between South Africa, the West Indies, New Zealand, India and Pakistan.

One-day, single-innings matches, with each side limited to an agreed number of overs, have become very popular in recent years.

Crime is an action that is punished by law because it is considered harmful to the community. Certain actions, like murder and stealing, are treated as crimes in nearly all countries. But other actions may be looked upon as criminal in one

Different sections of the British police force combine on a search operation. Dogs, horses, cars, motor-bikes and radios all help policemen and police women to maintain law and order efficiently.

Safe-breaking is an example of a crime against property. Such actions are looked on as criminal by people of all countries and beliefs.

country and permissible in another. For example, *blasphemy* (insulting God or religion) is punished as a crime in several countries of western Europe, but is not considered a crime in the USSR.

Most crimes fall into one of three groups: crimes against the state, crimes that cause death or personal injury, and crimes against the property of other members of the community. Examples of crimes against the state are treason, and mutiny by members of the armed forces. Many less serious offences also come into this category, which includes smuggling articles through the customs and refusing to fill in a census form. Crimes causing death or injury include murder, manslaughter and assault. And crimes against other people's property range from frauds and robberies involving millions of pounds' worth of property to such offences as finding a purse in a bus and keeping it without making any effort to return it to its owner.

Generally speaking, a person is not considered guilty of crime unless he has a 'guilty mind'—that is, unless he knows that a certain action is wrong but, nevertheless, deliberately performs it. Criminals (people found guilty of a crime, after being tried in a lawcourt) are punished by being made to pay a fine or by imprisonment. In some countries, people found guilty of murder or other very serious crimes suffer *capital punishment*—that is, they are put to death. Experts today think that much crime results from bad social conditions. They believe that criminals generally need help more than punishment.

It should be understood at the outset that the principal object to be obtained is the prevention of crime. The security of persons and property, the preservation of the peace, and all the other purposes of the police service will be effected better by that means than by the detection and punishment of offenders after crimes have been committed.

Instruction to London police 1829-1970

Some men use statistics as a drunken man uses a lamp-post—for support rather than illumination.

Andrew Lang

What you do not want done to yourself, do not do to others

Babylonian Talmud

Crimea is a peninsula in the southern part of the USSR, extending into the Black Sea. A narrow *isthmus* (neck of land) connects it to the rest of the Ukraine. To the north-east of the Crimea is the Sea of Azov. About 1,623,000 people live in the Crimea. Its chief town is Simferopol.

The northern part of the peninsula is a dry *steppe* (plain) with vast wheat and cotton fields. Farther south are forest-covered mountains. Along the southern coast is the so-called Russian Riviera, whose many resorts include Yalta, where Churchill, Roosevelt and Stalin met in 1945. The Crimea has tobacco fields and vineyards, and has iron mines in the east. Sevastopol is its main seaport.

The Crimea belonged to Turkey for 300 years before Russia took it in 1783. Russia fought Britain, France and Turkey in the region during the Crimean War of 1854-1856.

An old print of a sentinel keeping guard during the bitter winter of 1854-55, when the British besieged Sebastopol.

Crimean War In 1853 Russia invaded the Turkish Empire to protect Christians living there. Britain and France were afraid that Russia wanted to break up the Turkish Empire and gain power in the Eastern Mediterranean. They allied with Turkey and declared war on Russia in 1854.

The Allied army landed in the Crimea in September 1854. They wished to capture the naval base at Sebastopol. The Russians were defeated at the River Alma and Sebastopol was besieged. The Russians made two attempts to drive the Allies away, in the indecisive battles of Balaclava and Inkerman. At Balaclava, muddled orders caused 700 cavalry of the Light Brigade to charge the Russian guns. Over one-third of the men and two-thirds of the horses were killed.

The winter of 1854-55 was very cold, and the supply system of the British army was bad. The soldiers did not have enough food, fuel or warm clothes. Thousands died of disease in spite of the efforts of Florence Nightingale and her nurses. The miseries of war were made public for the first time by photographers and newspapermen.

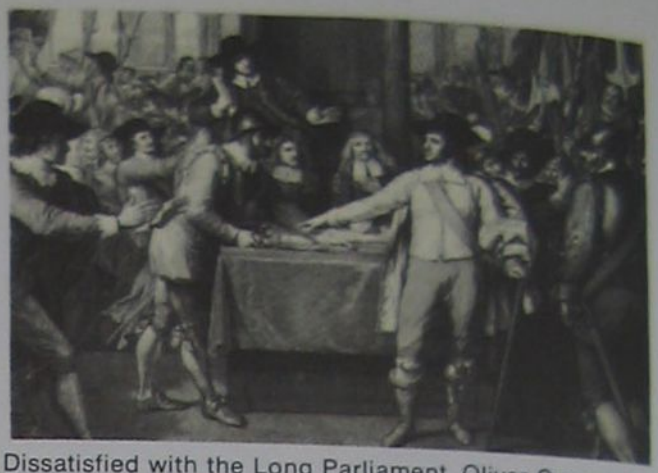
Sebastopol finally fell in September 1855. Peace came in 1856, but none of the countries involved in the war had achieved anything of importance. (See Nightingale, Florence.)

Crockett, Davy (1786-1836) was a famous American frontiersman about whom many legends have grown up. He was renowned for his courage, humour, and skill as a marksman and hunter.

Crockett was born in Tennessee but ran away from home at 13. He became a skilled hunter and won fame as a marksman when fighting the rebellious Creek Indians in 1813. He spent many years as a hunter and guide, and in 1826 was nominated for the U.S. Congress. He served in Congress from 1827 to 1835,

creating a sensation with his humorous stories.

In 1836 Crockett moved to Texas and joined the volunteers who were fighting for Texan independence from Mexico. He was among a small group of Americans who were besieged in the Alamo, an old Spanish fortress in what is now the centre of San Antonio. Surrounding them was a large Mexican army under General Santa Anna. Crockett died in the fierce fighting which led to the fort's capture.



Dissatisfied with the Long Parliament, Oliver Cromwell dissolved it on 20 April 1653 with the memorable words, 'What shall we do with this bauble? Here, take it away', referring to the mace.

Crocodiles and alligators are large reptiles found in tropical regions. They can be told apart by comparing the shape of the snout: the crocodile has a pointed snout whereas the alligator's snout is rounded. In addition, an alligator's teeth are invisible when its mouth is closed. In the crocodile, the lower fourth tooth remains visible.

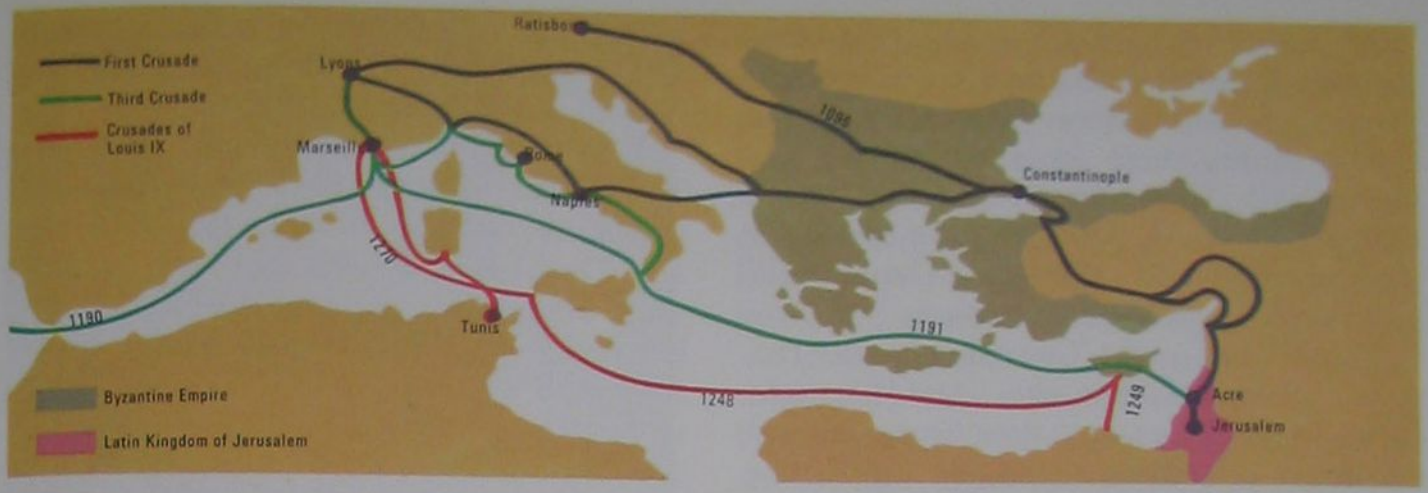
Crocodiles live in rivers and swamps; some live in salt water, inhabiting brackish swamps on the coast. They can move about on land by using their four short legs, but most of their time is spent floating in the water with their eyes and nostrils just above the surface. They feed on fish, birds, and small mammals, seizing them in their great jaws. The crocodile can close its mouth powerfully, yet the muscles that open the mouth are so weak that a man can hold the jaws shut. Crocodiles are more aggressive animals than alligators. There are 14 species found in the tropics all over the world.

The crocodile has a long, pointed snout, and the fourth tooth in the lower jaw remains visible when the jaws are closed. These features distinguish a crocodile from an alligator.

There are only two species of alligator. One lives in the south-eastern United States and the other in China. They are fresh-water animals and resemble crocodiles in their habits. Men catch crocodiles and alligators and sell their hides for leather. The alligator is now growing scarce and is protected in America.

Crocodiles and alligators belong to the family *Crocodylidae,* and are known as crocodilians.

Cromwell, Oliver (1599-1658), ruled England in the mid-1600's during the periods known as the *Commonwealth* and the *Protectorate*. He was the only man ever



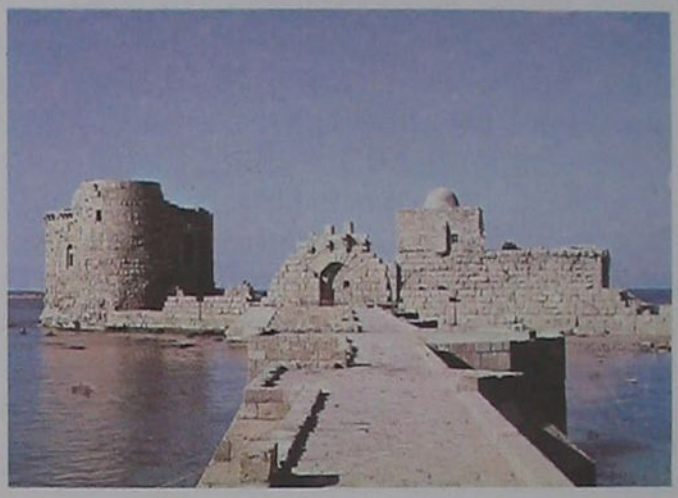
Above: The First and Third Crusades, and the Crusades of Louis IX of France. Right: A crusader castle at Sidon near Beirut in the Lebanon.

to rule the country as leader of a republican government. The period of his rule did much for the development of parliamentary government.

Cromwell was elected to Parliament in 1628. A deeply religious man, he became a Puritan. Puritans were Protestants who believed in simple religious worship. After the Civil War began in England in 1642, Cromwell fought for the Parliamentarians (those who believed the king should rule with the agreement of Parliament) against the Royalists (supporters of King Charles I).

The Parliamentarians did not agree among themselves and split into two groups, the Presbyterians and the Independents. Cromwell feared that the Presbyterians would bring back Charles I to power and that the Presbyterian Church would be made the official Church in England. He believed passionately that people should be allowed any religion they wanted. He united the army and supported the Independents. He brought Charles I to trial and had him executed in 1649.

Oliver Cromwell was an ardent Puritan and hated vanity and frivolity. When an artist came to do his portrait, Cromwell insisted that the painting should not flatter him and demanded that he should be shown as he really was, 'warts and all'. Although he was a God-fearing man, Cromwell is still remembered with hatred in Ireland for the savage way he put down a rebellion there.



After the Commonwealth, or republic, was set up, Cromwell severely crushed any opposition to Parliament. Parliament gave him Hampton Court Palace to live in and offered to make him king, but he refused the crown. Instead, he accepted the title of 'Protector' and the power to make laws when Parliament was not assembled. By the year of his death, Cromwell had established peace.

Crusades In the eleventh century Christians grew worried when the Turks (see Turks) conquered Palestine and captured Jerusalem (1076). The Turks were Muslims, and stopped Christian pilgrims from travelling to the Holy Land. When the Emperor of Constantinople asked the Pope for help against the Turks, Pope Urban II called a great Council at Clermont in France (1095). He promised pardon for sins to all Christians who would go to fight the Turks, and so the Crusades (wars of the cross) began.

All sorts of men went on the Crusades. Knights loved fighting and hoped to win glory and lands. Poor people wanted a change from their lives of toil in the fields. All Crusaders felt they were fighting for God. They wore a cross for their badge and shouted 'Deus Vult' (God wills it) as their battle-cry.

There were eight Crusades in all. The most successful was the First Crusade (1096-1099). Jerusalem was captured and Christian kingdoms were set up in the lands which had been won. In 1187 the Turks took back Jerusalem. This led to the Third Crusade (1190-1192). This was the most exciting Crusade, for among those who joined it was King Richard the Lionheart, the most famous soldier in Europe. Richard recaptured Acre but could not take Jerusalem, for the Turks also had a great and clever leader named Saladin. The later Crusades were not important. The Crusaders lost their zeal and began to quarrel amongst themselves. The Turks were skilful fighters and not easily beaten.

Meanwhile, some Christian knights formed themselves into Military Orders (called Templars and Hospitallers). They took vows like monks and lived in the Holy Land. There they built great castles with large round towers and thick walls. Their task was to help pilgrims and defend them from the Turks.

Europeans learned much from the Turks. They brought back spices and sugar and found out how to make paper and fine silk. They learned more about mathematics and astronomy which the Turks had learned from the Chinese and the Arabs. Above all, Europeans and Turks learned to respect each other's courage and ideas.

Crustaceans are a class of animals including water-fleas, barnacles, woodlice, lobsters and crabs. They belong to the *phylum* (major group) of animals called *arthropods*, which have joined legs and bodies made up of jointed sections. Each body section of a crustacean usually bears a pair of legs. Crustaceans have no internal skeleton, but a stiff outer covering, the *exoskeleton*, which supports and protects the body. Most crustaceans live in water. Many of them have pincers to catch their prey and defend themselves.

Shore-slaters (1) and woodlice (2) are land dwellers. Daphnia (3) lives in fresh water. The others live in the sea. Larvae of crabs (4) and barnacles (5) and *Calanus* adults (6) live in the plankton, sand hoppers (7) among pebbles, barnacles (8) on rocks, shore crabs (9), hermit crabs (10) and lobsters (11) around the shore and deep-sea prawns (12) in the depths.

Many crustaceans, such as crayfish, are caught for food.

Crustaceans are usually born from eggs which are often carried around by the parent. Some young crustaceans resemble their parents, but others look quite different. The young animals *moult* several times as they grow. During moulting, the shell splits open and the crustacean removes the old shell and grows a new larger one. The animal may lose a limb in this process, but it soon grows a new one.

One of the simplest crustaceans is the fairy shrimp. It is not a real shrimp and it lives in freshwater pools. All of its legs are alike and they are all used for swimming, feeding and breathing. A common freshwater crustacean is the water-flea. It is about a tenth of an inch long and has a transparent body through which the heart and other organs can easily be seen. Water-fleas, also known as *Daphnia,* are used as food for fish in aquariums.

The tiny crustaceans called *copepods* are also important as food for fish. In the sea, copepods form an important part of the *plankton,* the minute floating organisms on which many fish feed. A freshwater copepod is the cyclops, a small crustacean with one eye at the front of its body. It is named after the Cyclops, the one-eyed giants of mythology.

Ostracods are tiny crustaceans found in fresh and salt water. They are unusual because their bodies are enclosed in two shells, like many sea-shells.

Barnacles belong to the group of crustaceans called *Cirripedia.* They cling to rocks on sea-shores and to ships and piers. The barnacle's body is enclosed by a hard shell, and the legs stick out and trap food.

Isopods are crustaceans that live mainly on land, usually in damp places. Woodlice live under stones or fallen trees, and sometimes in cellars and old buildings. When disturbed, some species can roll up into a tight little ball.

Amphipods include small freshwater shrimps. One, *Niphargus,* is blind and white and found in caves. The sandhoppers found on beaches are amphipods.

The best-known crustaceans are the *decapods*—the crayfish, marine shrimps and prawns, lobsters and crabs. The name decapod means 'ten legs', and these crustaceans have five pairs of walking legs, including their pincers. They also have several pairs of swimming legs on the hind part of their bodies. Crayfish live in fresh water, whereas the others are marine animals. They are all valued as food, often being considered as a great delicacy. Among the strangest are the hermit-crabs, which have a soft shell and inhabit the discarded shells of other marine animals such as whelks. The most fearsome in appearance are the spider-crabs, with their long spindly legs and large pincers.

The largest crustaceans are the Giant Spider Crabs of Japan. Specimens have been caught measuring 12 feet from claw to claw. The heaviest crustacean ever landed was an American lobster caught in 1937. It weighed 42½lb and was four feet in length. This type of lobster can live for over 50 years.

Crystals The majority of substances are made up of crystals. In some cases individual crystals can be seen without

THE SEVEN CRYSTAL SYSTEMS

difficulty, but more often it is necessary to use a microscope to see that a substance such as iron is made up of crystals.

Each crystal has a definite shape. Its surfaces are flat and any two adjacent sides meet at a definite angle. When a crystal is split up it usually breaks in such a way that the fragments are related in shape to each other and to the original crystal.

Crystals display an enormous variety of shapes and sizes. But they can be grouped into seven systems—cubic, tetragonal, hexagonal, orthorhombic, monoclinic, trigonal and triclinic.

The regularity of crystal shapes, and the fact that they can be split into equally regular fragments suggests that a crystal is composed of 'units' arranged in a very orderly way. These 'units' are, in fact, simple arrangements of atoms, molecules (tightly bound groups of atoms) or ions (atoms that have become electrically charged by gaining or losing electrons) which appear in a regular, repeating pattern called a *lattice*.

One of the greatest sources of weakness in a substance is caused by layers of atoms in a lattice sliding over each other. In an alloy such as steel 'foreign' atoms of carbon strengthen the iron because they upset the regular iron lattice, making it more difficult for layers of atoms to slide over one another.

Talking Points

*It is a fairly simple process to make your own crystals. Buy some Copper Sulphate solution from the chemist and pour into a wide mouthed container. As the liquid evaporates, crystals of copper sulphate will form at the bottom of the container.

*When you have produced some crystals, take a large one out and suspend it in another beaker containing copper sulphate solution. As this solution evaporates, the crystal will *grow*.

*Discuss these simple experiments and try to explain why they work. If you have any difficulty, ask your teacher to help you.

Articles to read

Frost; Geology; Jewellery; Minerals; Quartz; Snow.

Cuba is an island republic in the West Indies. Its capital, Havana, lies about 150 miles from the coast of Florida in the United States.

Half of the land is flat and the rest is hilly with high mountains in the south-east. Coral reefs and islands surround

Fidel Castro came to power as a result of a revolution in 1959. Cuba then became the first Communist country in the West. Castro ended an oppressive dictatorship under Batista, but has had difficulty maintaining his country's economy. He often gives long speeches on radio and television.

much of Cuba's coast. Crocodiles infest the inland rivers and the forests contain deer, wild pigs and many kinds of birds. The warm, pleasant climate is marred by fairly frequent hurricanes.

Most Cubans are descendants of the original Amerind people, of Spanish settlers or of African slaves. Many are the descendants of mixed marriages. Nearly all are Roman Catholics. They work mainly on farms, growing sugar and tobacco. Some people work in mines, because Cuba is rich in minerals. Sugar, minerals and tobacco are important exports.

Christopher Columbus landed in Cuba in 1492 and began 400 years of Spanish rule. In 1898, following the Spanish-American War, Cuba broke away from Spain. In 1902, it became an independent republic under United States influence. In 1959, Fidel Castro came to power. Castro aimed at ending American influence. In 1961, with American support, Cuban exiles tried to invade Cuba. A year later, Russian military engineers built missile bases in Cuba. Their action almost led to war between the United States and Russia. The missiles were removed, but Cuban-American relations remained strained.

In the early 1970's Cuba continued to receive economic and technical aid from Russia. Cuba also underwent a series of economic crises owing to the country's failure to produce enough sugar to export.

Facts and Figures
Area: 44,218 square miles.
Population: 8,553,000.
Capital: Havana.

Above: The most important crop in Cuba is sugar cane, and it is cut by hand when harvesting time comes. Centre: Location map of Cuba. Below: A colourful street scene in Havana, the capital of Cuba.

Cuckoo The cuckoo is well-known for its unmistakable call, from which it gets its name, and for its habit of laying its eggs in other birds' nests. Cuckoos are fairly large birds, with slender wings and tails. They are found in most parts of the world, but mainly in tropical areas.

A female cuckoo lays only one egg in each nest, and an individual cuckoo will almost always keep to one kind of nest—such as that of the meadow pipit. The cuckoo's egg is usually larger than that of the host bird, but it has a similar pattern and is accepted by the host bird as one of its own. When the egg hatches, the young cuckoo pushes the other eggs or chicks out of the nest, and the foster parents continue to feed it until it is fully grown. In the final stages, the young cuckoo may be two or three times the size of the foster parents that feed it.

Many people listen for the first call of

There are 127 known species of cuckoo and they are distributed throughout most of the Earth. The call of the cuckoo is so distinctive that the bird has a similar name in most languages. In French it is coucou; *in German* kuckuck; *in Russian it is* kuk-ushka *and in Japanese* kak-ko.

the cuckoo as a sign of returning spring. Only the male bird sings 'cuckoo'.

Cumberland, a mountainous county in the extreme north-west of England, was part of Scotland until 1157. Its county town is Carlisle, and its area is 1,520 square miles.

Two-thirds of England's beautiful Lake District lies in Cumberland, and attracts many tourists. Much of it belongs to the National Trust. In the north-west, where the county borders Scotland, lies the fertile Solway Plain. The Pennines rise to nearly 3,000 feet in the east. In the south-west, the Cumbrian Mountains include such well known peaks as Scafell Pike (3,210 ft), the highest mountain in England, and Skiddaw (3,053 ft). Among the many magnificent lakes are Buttermere, Ullswater and Wastwater.

Agriculture is the main occupation, with rough grazing of cattle and sheep; mining is the main industry after tourism.

Madame Curie sits in her laboratory.

Curie, Marie (1867-1934) and **Pierre** (1859-1906). The oppression of the Polish people by the Russian Tsars caused Marie Sklodowska, a gifted young chemist, to escape to France where she met Pierre Curie, a French scientist who was engaged in experimental work in physics. Becoming friends through the common interest of their work, the two scientists married.

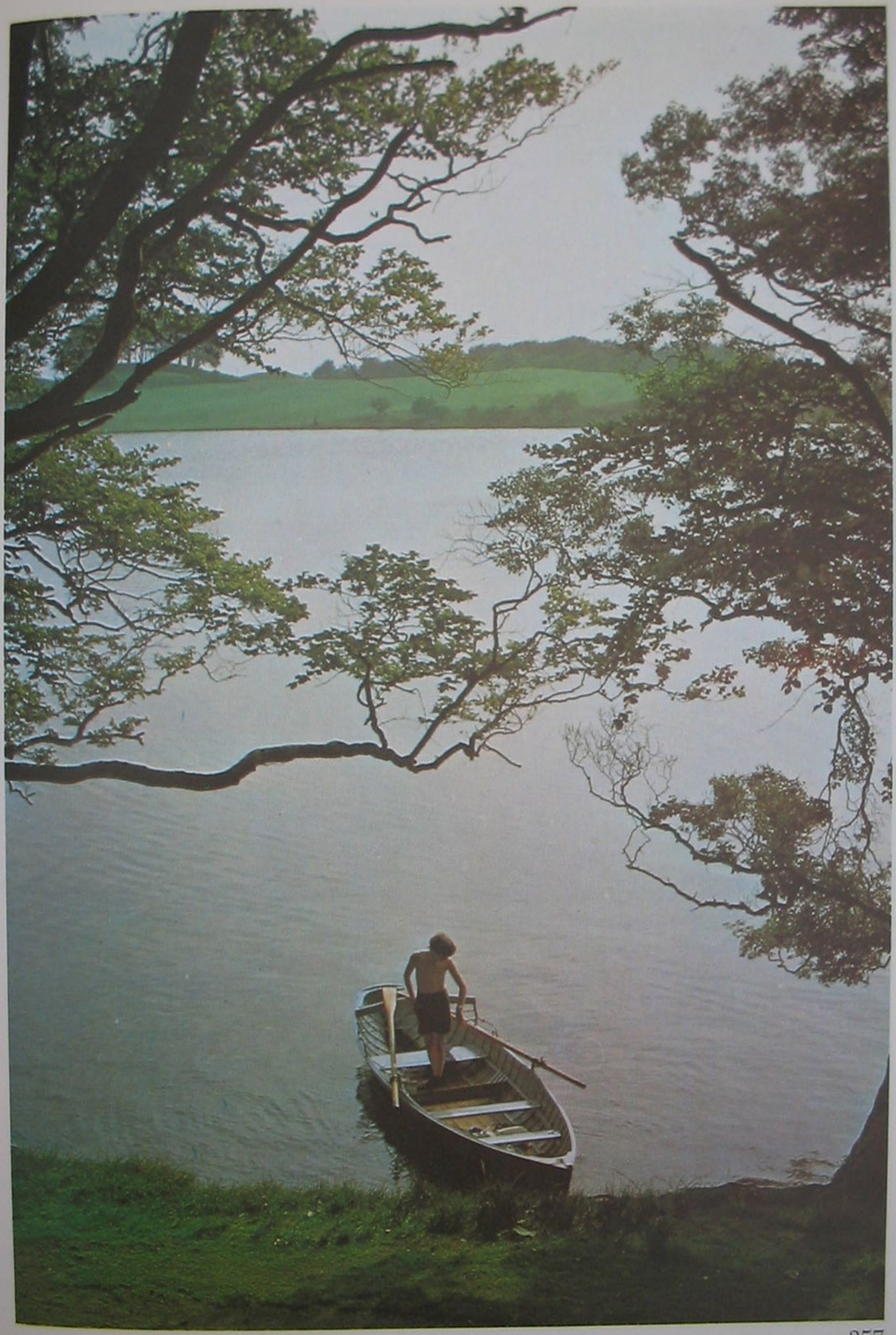
Because both were extremely poor, the Curies carried out their experimental work in makeshift laboratories, but obtained results which were to transform the worlds of science and medicine.

They examined a mineral called pitchblende and obtained from it a radioactive element which Madame Curie named polonium in honour of her mother-country. After more years of patient labour, she obtained a tiny specimen of radium and assigned it to its right place among the elements. Radium has been the starting point of many researches into the structure of the atom. It has also been extensively used in the treatment of cancer.

The Curies received many honours in recognition of their pioneer work. Madame Curie was twice awarded the Nobel Prize: jointly with her husband in 1903 and again in 1911. Madame Curie succeeded her husband as professor at the University of Paris.

Custer, George Armstrong (1839-76), was an American army officer who gained lasting fame for the battle against the Indians in which he was killed.

Right: A small lake in the 'Lake District' of Cumberland, England. This area has been made a national park and thousands of tourists go there every year to enjoy its beauty.



Born in Ohio, Custer became the youngest general in the Union Army during the Civil War. He was only 23. After the war he was given command of the 7th Cavalry, who were fighting Indians in the south-west. In 1876 they were ordered to round up the Sioux and Cheyenne Indians and take them to reservations. In June, as Custer was advancing into Montana with 650 men, scouts brought him news of a Sioux village a short way ahead on the Little Bighorn River. Custer thought it contained some 1,000 Indians and decided to capture it without waiting for specific orders. But the village held between 2,500 and 5,000 Indians. Custer divided his men into three groups, and in the battle that followed the Indians, led by Sitting Bull, killed Custer and his group of 267 men. This battle became famous as 'Custer's Last Stand'.

Most people agree that Custer was an able military leader, but many people also think that he was reckless and risked the lives of his men in the hope of personal glory.

Cybernetics is a branch of science which deals with information and control systems in both machines and animals. Animals have many built-in automatic control systems which enable them to survive. For example, if a person's body is too hot, the sweat glands automatically open and give off water. The water evaporates and cools his body.

Many automatic control systems are now being used in industry. The thermostat is a simple example. If, say, a boiler is too hot, a thermostat automatically switches off the heating. And the boiler cools down. Many machine control devices are more complicated than this. But none are anywhere near as complex as those in the human body.

Cycling As a pastime, cycling began on a popular scale in England in 1889 with the invention of the pneumatic tyre and safety bicycle. It is now universally popular and many different types of machine are available. Cycle racing dates back to a 'velocipede' race over two kilometres held in Paris, France, in 1868, and has since taken various popular forms on machines ranging from solo to multi-cycles, which carry three or more riders, on the road, across country (Cyclo-Cross), or on the track. In every case the motive power is supplied by the rider, or riders.

Track cycles do not have free-wheels, wing-nuts, brakes or similar accessories. Track circuits are specially constructed with hard surfaces and banked bends for races ranging from 440 yards sprints upwards for individual riders and teams.

Road races may be over any distance up to thousands of miles; an example of the latter being the famous annual 'Tour de France' which takes up to a month to complete.

The highest speed ever achieved on a bicycle is 127.243 mph by Jose Meiffret of France using a 275-inch gear behind a windshield on a racing car. This was achieved at Freiburg, West Germany, in

The 25 mile race for the British amateur bicycle championship of 1875. Bicycles were then called penny-farthings.

Two cyclists race in the *Tour de France*. This race is the most famous in the world and also one of the most gruelling.

1962. World amateur championships began in 1893, professional championships two years later.

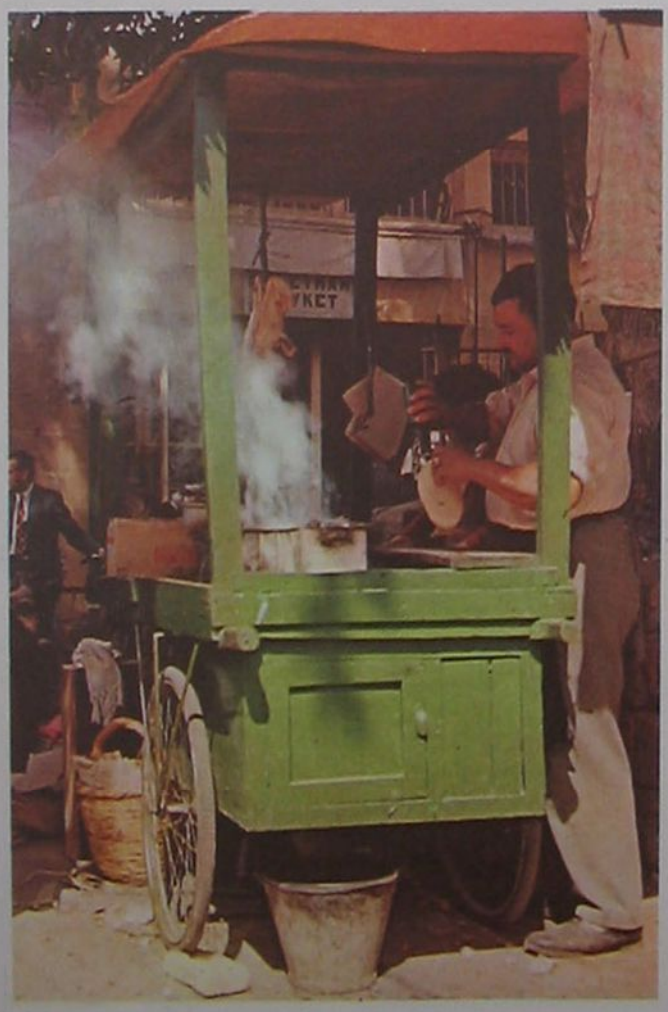
Cyprus is an island in the eastern Mediterranean Sea. The Kyrenia Mountains run along much of the northern coast and the Troodos Mountains lie in the west. In the east is the low-lying Mesaoria Plain. The climate is warm. Rainfall averages 14 inches a year on the plain, but is three times as much in the mountains.

About half the people are farmers, who grow such products as citrus fruits, grapes, cereals and vegetables. Many people work in iron ore and copper mines, or in various light industries.

Location map of Cyprus.

Most of the people of Cyprus speak Greek and belong to the Greek Orthodox Church. But about one-fifth of the people are Turkish-speaking Muslims.

The Turks ruled Cyprus from the 1500's until 1878. In the 1800's, Greek Cypriots began a campaign for *Enosis*, a Greek word for *union*. The movement aimed at the union of Cyprus and Greece. British rule began in 1878. In the 1950's, the Enosis movement was revived. This led to fighting between Greek and Turkish Cypriots. Cyprus gained independence in 1960, and Archbishop Makarios, leader of the Orthodox Church in Cyprus, became president. Greeks and Turks fought each other many times in the 1960's. United Nations soldiers intervened to keep peace.



Above: The old town at Famagusta, Cyprus. Below: A food stall in a market place in Cyprus.

Facts and Figures
Area: 3,572 square miles.
Population: 636,000.
Capital: Nicosia.

Czechoslovakia is a long, narrow country in central Europe. It is surrounded by Germany on the west and northwest, Poland on the north, Russia on the east, and Hungary and Austria on the south.

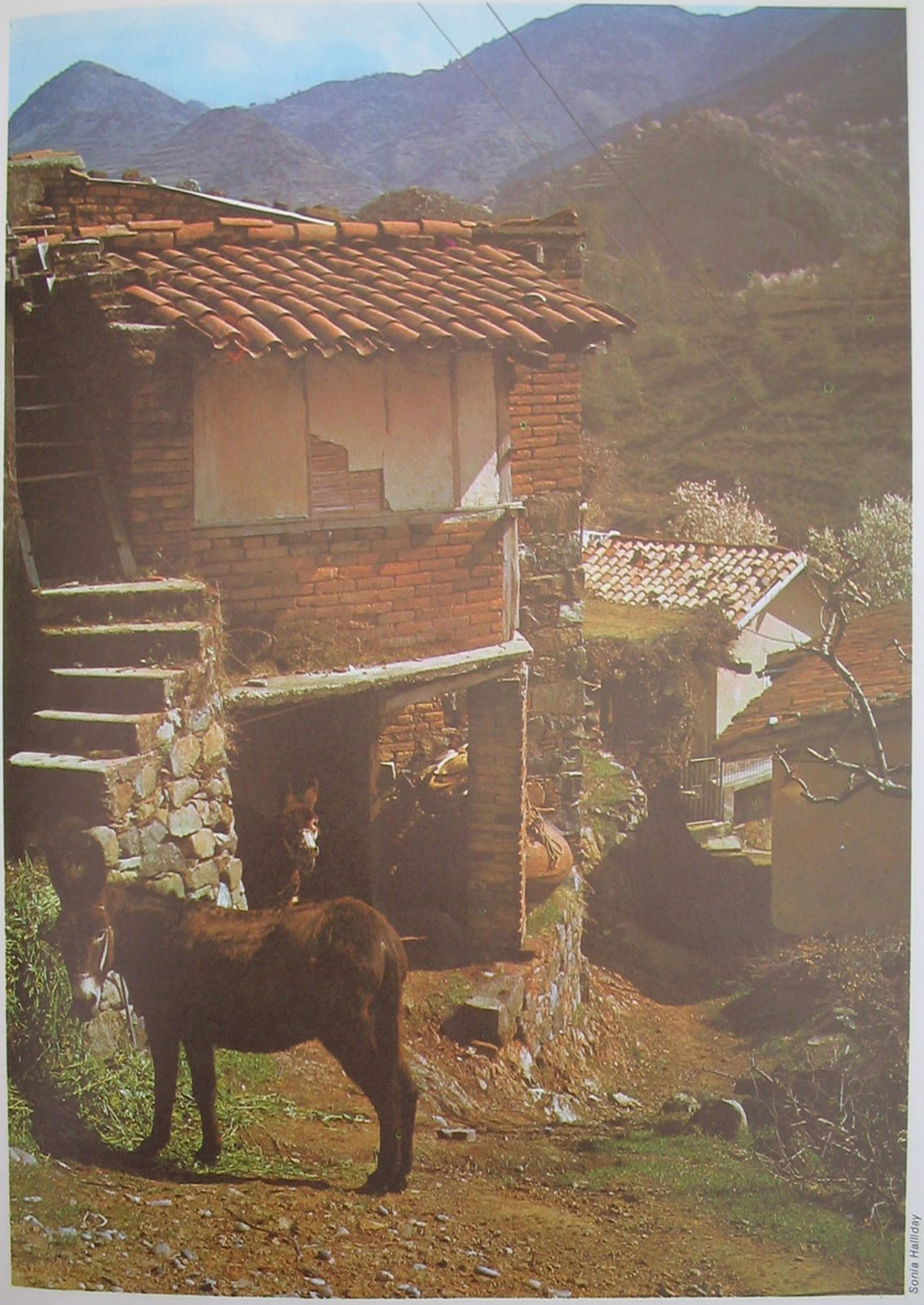
Bohemia, the western part of Czechoslovakia, is a high plateau surrounded by mountains. The River Elbe flows through a fertile valley in the north. Moravia, east of Bohemia, is largely a fertile lowland. Slovakia, in the east, is mostly highland, with many forests. But a lowland plain runs down to the River Danube in the south.

Most of the people are Czechs or Slovaks who speak their own languages. Many of them are skilled craftsmen, working in Czechoslovakia's many manufacturing industries. The country has rich deposits of coal, iron, uranium and other minerals, and produces nearly all its own food.

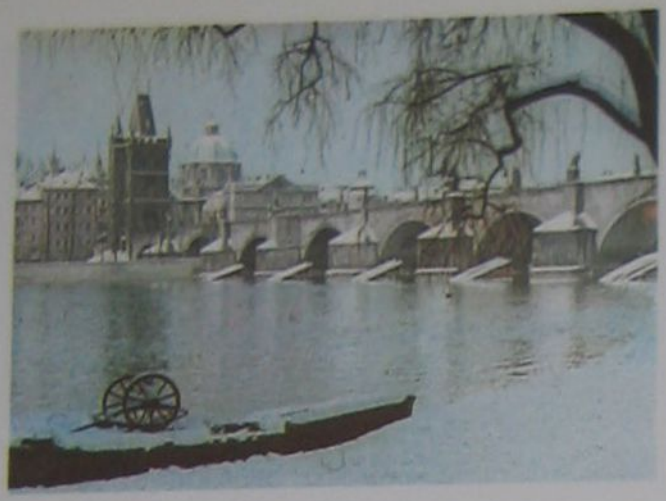
Czechoslovakia is a federal republic under communist control. Since 1968, Czechs and Slovaks have had their own regional governments.

For many hundreds of years, Bohemia and Moravia were under German or Austrian rule. From 1867, the Magyars of Hungary controlled Slovakia. In 1918, after World War I, Bohemia and Moravia joined with Slovakia to form a united country.

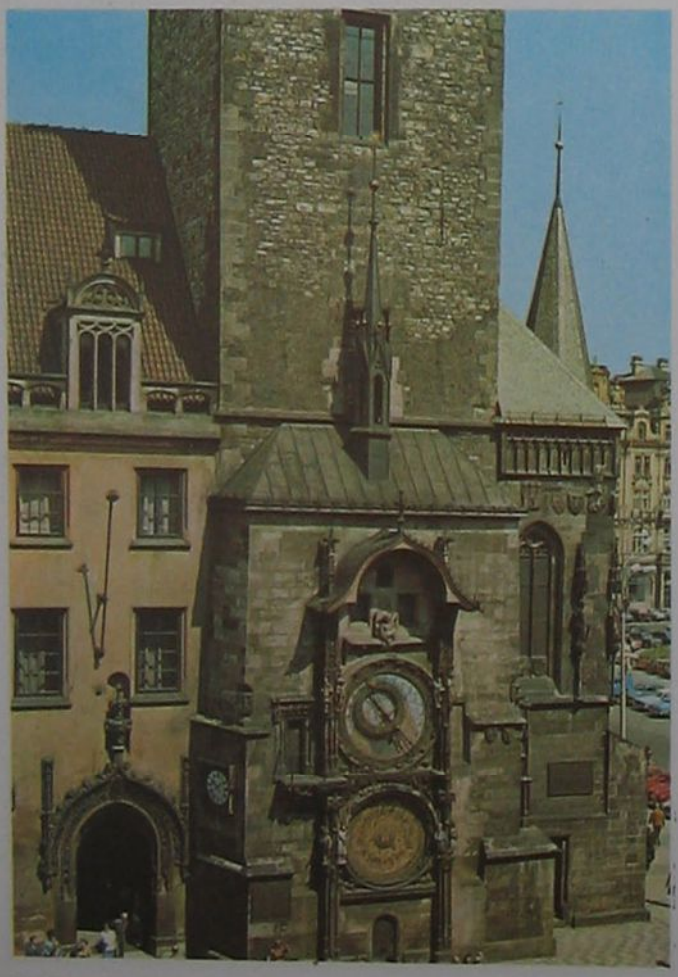
Right: The small village of Livadhia in the Troodos mountains of Cyprus. The villagers live simply and the donkey is still an important means of transport.



Sonia Halliday



Prague is the capital of Czechoslovakia, a land-locked country in the centre of Europe. Above: A view of a bridge across the River Vltava, which runs through the middle of Prague, in winter. Centre: Location map of Czechoslovakia. Below: The old clock tower of the City Hall in Prague.



In 1938, the German dictator Adolf Hitler demanded the German-speaking parts of Czechoslovakia. Other European countries forced Czechoslovakia to give up the territory. In 1939, the Germans, Hungarians and Poles seized the rest of the country. Russian troops freed Czechoslovakia in 1945. It again became independent, but remained under Russian influence.

In 1968, its Communist government tried to relax some of its strict laws. Russian troops then moved into the country to ensure that it remained Communist.

Facts and Figures
Area: 3,572 square miles
Population: 14,467,000
Capital: Prague.

D

Dahomey is a small country in West Africa. It has 2,876,000 inhabitants. It was formerly a territory of France, but has been independent since 1960. Porto Novo is the capital. Dahomey is long and narrow, with a coastline of 78 miles on the Atlantic Ocean. Its total area is 43,483 square miles. Dahomey is a poor country, with little industry. The people grow crops and catch fish for their own needs. Palm oil is the only important export. The biggest town and port is Cotonou.

Right: Location map of Dahomey.

Dahomey is politically unstable and there were no less than nine changes of government between 1960 and 1970.

Dairy farming is an important industry in temperate countries such as Australia, Denmark, France, the Netherlands, New Zealand, Switzerland, the United Kingdom and the United States. The milk that dairy cattle produce, and the cream, butter, cheese and other products that are made from the milk, are important foods.

Dairy cattle need to live on good grassland, with adequate rainfall and sunshine. They graze in the fields during the warm months of the year and, during the winter, are kept in sheds or barns where they are protected from the cold. In winter farmers feed them hay and *silage* (fodder preserved in silos, or storage bins). Cattle are also fed some grain all year round.

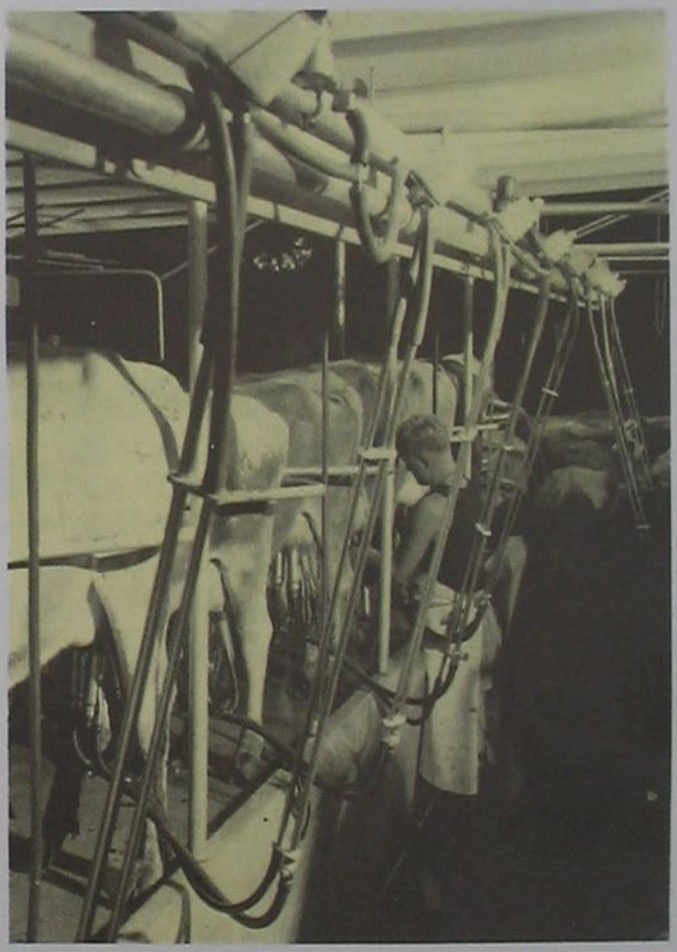
All cows produce milk to feed their calves. They produce the milk for about 10 months following the birth of a calf. Farmers usually arrange for their cows to give birth to calves at about the same time each year, so that they will produce milk during most of the year.

Since the mid-1700's, farmers in Britain and other countries have carefully bred their cows to produce offspring giving larger quantities of richer milk. On the most advanced farms, careful records are kept of the amount and quality of the milk produced by each cow. By mating the offspring of the cows which have the best records, the quality of the breed is improved.

Dairy farmers raise the breeds of cattle that are known for their high milk production. The breed they select depends on whether they want milk for drinking or for making butter, cream and other products. For milk products, a rich milk is best—that is a milk that has a high *butterfat* content.

Friesian cows give the most milk, but it is low in butterfat. *Ayrshire* and *Brown Swiss* are other good producers.

Above: These young calves are feeding on a farm in New Zealand, where dairy farming is very important to the country's economy. Below: A milking shed on a New Zealand dairy farm.



Jersey and *Guernsey* cows give the richest milk. The average milk yield for a cow is about 2.5 gallons a day.

Dairy herds vary greatly in size—from 25 cows on a small farm up to 500 cows on a really large one. Depending on the quality of the grass, each cow will require from two to ten acres of land to feed on.

Generally, cows are milked twice a day, early in the morning and late in the

Above: A milk tanker arrives at the farm to take on milk. At the dairy, the milk is bottled or used to make cream, butter and cheese. Below: Packing butter in the dairy for sale to shops.

afternoon, in a clean cowshed or special room called a milking parlour. In the past, milking was a slow process, done by hand. The milker sat on a low stool and pulled and squeezed the cow's teats. The milk squirted into a bucket.

On small farms, cows are still milked by hand, but large farms almost always have *milking machines*. These machines were developed in the early 1900's. Milking machines extract the milk by suction.

The milk goes directly by pipeline to a cooling tank or milk-house. Because no air reaches the milk, it stays fresh and pure. It is then taken by refrigerated lorry to a processing plant.

At the plant the milk is first *pasteurized* (heat treated) to kill bacteria. If it is intended for cream or butter the milk is separated from the cream by means of a *centrifuge*, a device that spins it around rapidly. Formerly, milk was separated by leaving it to stand until the cream rose to the top, but that was very time-consuming. The cream is churned to make butter. Cheese can be made from the whole milk or parts of it.

Australia, Denmark and New Zealand are among the countries that produce more milk than they need for home consumption. These countries export large quantities of cheese and butter, and of evaporated, condensed and dried milk. New Zealand exports about 85 per cent of its dairy production, most of it to Britain.

Because serious diseases can be spread to Man through contaminated milk, dairy farmers take precautions to protect the health of their herds. Equipment is washed and sterilized after each milking. Buildings are cleaned and disinfected regularly, and workers receive periodic health checks. Veterinary surgeons inoculate the cattle when necessary and test the milk for signs of tuberculosis or brucellosis.

Daisy family This is the largest and one of the most successful families of flowering plants. The scientific name of the family is *Compositae,* and it has this name because its 'flower' is really a composite bloom made up of lots of flowers all bunched together into a head or *capitulum.* All members of the family are *dicotyledonous* – that is, their embryos are equipped with two seed leaves, and their leaves are not parallel-veined.

The daisy family contains some of the prettiest flowers as well as some of the most troublesome weeds. Popular garden members include dahlias and Michaelmas daisies, while the unpopular ones include daisies, dandelions, thistles and groundsel.

The head of a composite flower varies according to the species. In a thistle, each tiny flower consists of five petals fused to form a tube. This is called a tubular floret. Within the petals lie five stamens, whose anthers are fused into a

tube. The ovary is set beneath the floret and is crowned with a bilobed stigma that sticks out of the top of the floret. The sepals develop as a tuft of hairs that carry the fruit away on the wind.

In a dandelion, each floret has a long flap-like extension on one side called a *ligule*. Both tubular and ligular florets are present in the same head in daisies. The central disc of a daisy head consists of numerous yellow tubular florets (disc florets), while around the circumference are arranged a ring of white ligular florets called ray florets.

Dalton, John (1766-1844), was an English scientist. He made one of the biggest contributions to the progress of theoretical chemistry.

Dalton began his working life as a schoolmaster, but resigned after six years to devote his life to research.

He developed the theory that all *matter*, of which all physical things are formed, is made up of *atoms*. These are very small particles which cannot be broken down into smaller units by chemical means.

Dalton enabled the chemists who followed him to gain a much clearer knowledge of the constitution of chemical substances and chemical reactions, by defining the atom in greater detail.

In his atomic theory, Dalton said that the atoms of any one *element*—those substances which constitute matter—are identical and have the same *mass*. In addition, different elements have atoms of different mass. This is not accepted now.

Among his other contributions to chemistry was the idea for visual chemical

symbols. The atoms of each element had their own symbols. For example, hydrogen was a circle with a dot in the middle, while nitrogen was a circle with a vertical line through it.

Dalton and his brother were both colour-blind, and, as he was the first to describe it, colour-blindness is known as *Daltonism*.

The Romans ruled over Damascus from 63 B.C. to A.D. 635. Large parts of the city wall still survive.

Damascus (Esh-sham), with a population of a little over half a million people, is the capital of Syria. It is situated on the vast Plain of Damascus, 60 miles inland from the port of Beirut. The city is the country's communications centre, and trades in grain, metalwork, silks, and cotton goods and carpets. It is a picturesque city with pleasant public buildings and many mosques. The Great Mosque dates from the eighth century. The Damascenes claim their city to be the oldest continuously inhabited city in the world. The material known as *damask* derives from the city's patterned silks.

Dampier, William (1652-1715) was an English explorer and pirate. He joined the Royal Navy and took part in the Dutch War in 1673. Following a brief shore job in Jamaica, he spent some years sailing the seas of Central and South America, attacking Spanish treasure ships.

In 1682 Dampier retired to Virginia, but within 12 months he was back at sea again. On board the *Cygnet* he took part in many adventures and piratical raids in East Indian waters. In 1688, Dampier and his crew landed on the western coast of New Holland (now Australia) to look for provisions. They spent nine weeks there, depressed by the barren land and the hostility of the Aborigines. Dampier returned to England in 1691 and published the story of his adventures in *A New Voyage Round the World*.

As a result of his book, Dampier was given command of the *Roebuck*, and sent to explore the coasts of Australia. In his account of that trip, called *Voyage to New Holland*, Dampier described Australia as the most barren place on Earth. He died before he could enjoy the success of his voyage. The Dampier Archipelago and the Dampier Strait were named after him.

Dams Vast quantities of water are needed in towns for domestic purposes, in industry for cooling and manufacturing, and in agriculture for irrigation. To meet these needs, water must be stored, especially in countries where the rain falls only for a few months. The stored water can then be released gradually to give a steady supply over the whole year.

The main way of storing water is by building barriers called dams across rivers to form artificial lakes, or *reservoirs*. The stored water can also be used to spin huge water turbines which generate electricity.

Dams are among the most massive man-made structures in the world. The biggest ones are giant mounds of earth and rock packed tightly together. They are called *earthen*, or *embankment* dams.

An earthen dam has a very wide base and gradually curves inwards on both sides to become fairly narrow at the top. It has a clay or concrete core, or a steel or concrete facing to make it watertight. *Hydraulic-fill* dams are built from a water-borne mixture of sand, clay, and

gravel. The mixture is pumped into position through pipelines.

Other dams are built of concrete or stone blocks. *Arch* dams are suitable for blocking narrow gorges. They are curved towards the water in the shape of an arch. It is their shape which makes them strong. The weight of the water is

Highest Dams

Grande Dixence (Switz.)	gravity 932 ft.
Vaiont (Italy)	arch 858 ft.
Mauvoisin (Switz.)	arch 777 ft.

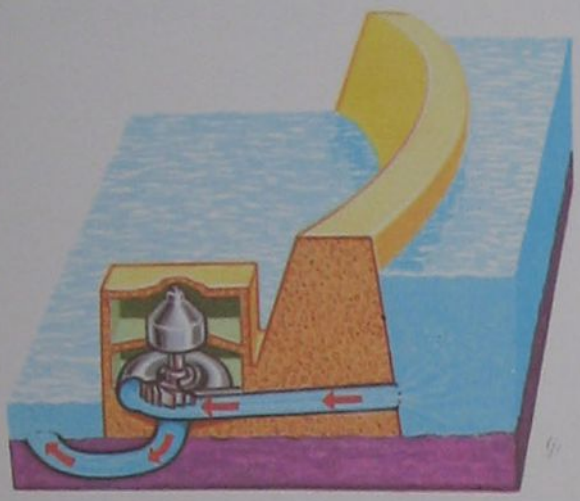
Largest Earth-fill Dams

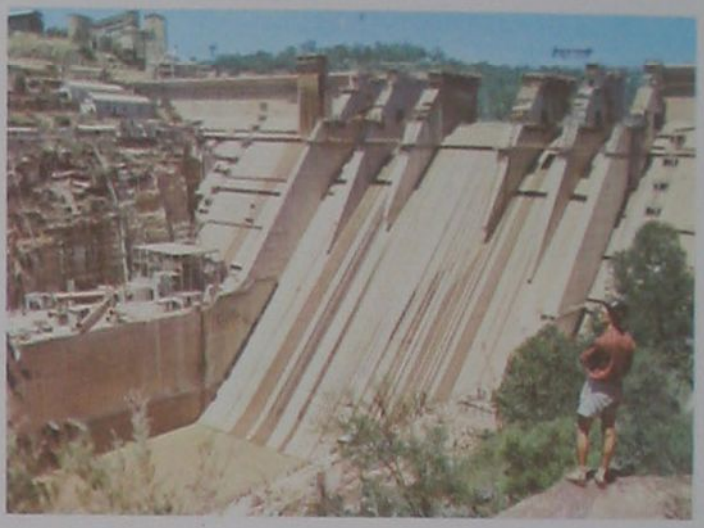
Fort Peck (U.S.A.)	125,600,000 cu. yd.
Oahe (U.S.A.)	92,000,000 cu. yd.
Garrison (U.S.A.)	66,500,000 cu. yd.

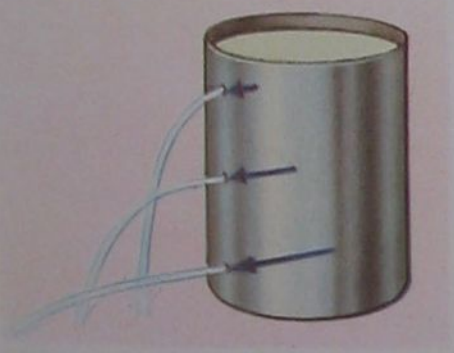
Largest Concrete Dam

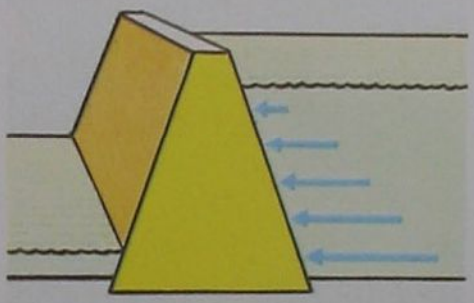
Grand Coulee (U.S.A.)	10,600,000 cu. yd.

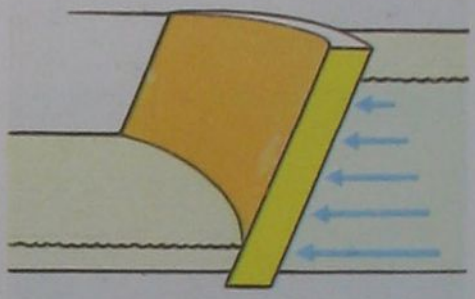
Right: A large dam under construction in New South Wales.
Below: Water from the lower level of the reservoir spins the turbines to generate electricity.







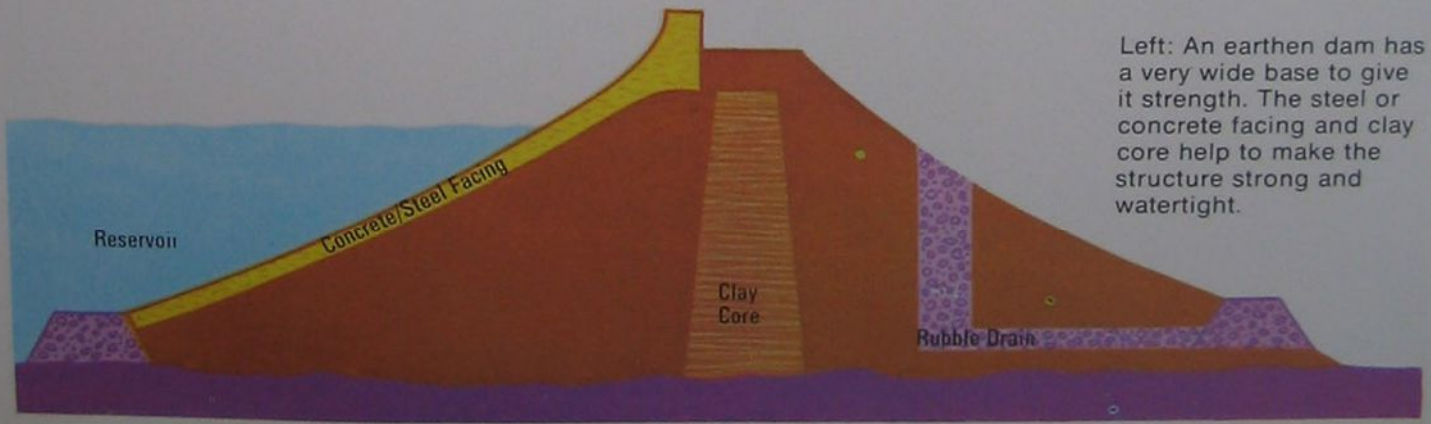




Above: Water pressure increases with distance from the surface. Thus the water in a can spurts out further from the bottom than from the top (left).

Because of the increase of pressure with depth a dam may be made thicker at the bottom to withstand it (centre).

Alternatively it may be curved and its top slanted towards the reservoir to spread the load (right).



Left: An earthen dam has a very wide base to give it strength. The steel or concrete facing and clay core help to make the structure strong and watertight.

transmitted down the arch to the sides of the gorge. *Gravity* dams rely on weight alone for strength. *Gravity-arch* dams are combinations of both types.

Dancing gives pleasure to many people as a relaxation, but it may also be considered as an art. European ballet is thought to have begun in Italy in the late 1400's. In Ballet there are a number of set classical movements that are danced in different combinations. (See Ballet). In Africa and Asia dancing may form a part of religious ceremonies.

All over the world, traditions of folk dancing have grown up over many hundreds of years. These traditions still survive today in many countries. In North America, square dancing is very popular, and in eastern Europe people regard folk dancing as something that everyone should be able to do. This is particularly true in Greece. In Latin America, folk dances are less formal than in other parts of the Western world, and they are performed with great enthusiasm.

In many of the richer countries, however, people now prefer to dance in ballrooms. Ballroom dancing developed from folk dancing, but it is more formal. Since the 1960s, young people have developed a much more individual way of dancing to the music of beat groups and pop groups.

Folk dances vary a great deal from place to place. Square dances are performed by groups of people often in long lines or units of four. The music is usually very rhythmic. Eastern European dances are often danced to music with much more complex rhythms than the music of folk dances in the rest of Europe. In Greece, dances are performed by a long line of people led by one person. But solo dances are also performed by the men. Some folk dances are so exciting and entertaining to watch, particularly those of Russia and Spain, that troupes of folk dancers

The highly stylised traditional dancing of the East (above) contrasts sharply with the freedom of modern dancing in the West (below).

Right: A class at a ballet school. Perfect control of body movements is essential for ballet dancers, who start their training at an early age.

from these regions appear all over the world.

The folk dances of Latin America, such as the samba, rumba, tango, and conga, are among the few folk dances to be found in the ballroom. The most popular ballroom dances are the quickstep, waltz, and foxtrot. Ballroom dances are performed exclusively by couples, unlike most folk dances. Modern dancing, with its freedom of expression, has become a solo performance for every dancer taking part.

Detail from a portrait of Dante by Giotto.

Dante Alighieri (1265-1321), perhaps the greatest poet of the Middle Ages, is known as the father of Italian literature. He was born in Florence and his father, thought to be a lawyer, and his mother died when he was still a boy. His education in Italy and probably in France was supervised by the statesman Brunetto Latini. Dante served in the Florentine army for a time.

When he was twenty-five, Dante wrote the first of his three main works, *Vita Nuova (The New Life)*, in which he describes his first sight of Beatrice, whose beauty inspired his devotion and his best work. She was probably Beatrice Portinari, who married Simone de Bardi. In 1290 Dante mourned her death. Some time after this he married Gemma Donati, and joined the Bianchi, or Guelph, party, which opposed Pope Boniface.

Dante reached high office in Florence, but because of the Pope's hostility was sentenced to be fined and imprisoned. He fled from Florence in 1301, and we know little of his wandering life from this time forwards. He spent some time in Paris before his death at Ravenna in Italy. He wrote his second principal work, the *Convivio (Feast)* in about 1300, but he is mainly remembered for his greatest work, the *Divina Commedia (Divine Comedy)*. In this allegorical poem, Dante describes his visit to Hell and Purgatory with the poet Virgil as his guide. The last part of the poem is about Paradise, where he meets Beatrice as an angel. Dante wrote in the Tuscan dialect, which has developed into the modern Italian language. Until his time, there was the possibility that one of the southern French dialects might spread down through Italy. But Dante helped to ensure that the Italian language would prevail.

Danube The Danube, a river of Central Europe, flows 1,740 miles from its source, in the mountains of the Black Forest, to the Black Sea. Some 400 tributaries join it on its long journey, west to east across Europe, to the many mouths of its delta.

The Danube is a German river in its

Left: Above Budapest the Danube cuts through the hilly Bakony forest and swings south to cross the Great Hungarian Plain.

upper reaches, and forms a highway for trade between Germany and central and eastern Europe. Goods are carried along its length through Austria, Czechoslovakia, Hungary, Yugoslavia, Rumania and Bulgaria to the Black Sea.

Once part of the boundary of Charlemagne's Empire, the Danube has played an important part in the history of Europe. The great Austrian Empire grew from the two states of Upper and Lower Austria on the Danube. Not until after the First World War was this empire finally broken up and Austria became a tiny republic.

The Danube Valley is very fertile, and crops of rye, oats and wheat are grown on its rich silt, as well as vegetables, fruit and vines. The power for the cornmills, sawmills and papermills along its banks comes from the river itself.

Vienna and Linz, both important Danube ports, are the main industrial centres of Austria. The chief natural resources are timber, oil, iron ore, copper, zinc, graphite and salt. Timber and paper products are the most important exports, but iron and steel goods, machinery, precision instruments, textiles, pottery, chemicals and leather goods are also manufactured.

The Iron Gates, on the Rumanian and Yugoslavian borders, is the narrowest point of the Danube. There, where it becomes a raging torrent with dangerous currents, making a way through the Carpathian Mountains, a dam is to be built by a joint effort by both countries. It is being built at Djerdap, below the point where the Danube widens.

Dark Ages Scholars of the 1400's gave this name to the period after the end of the Roman Empire in the 400's. It was 'dark' in contrast to the 'brightness' of the civilization of ancient Greece and Rome.

During this period Europe was ravaged by barbarians like the Goths, the Vandals and the Huns, who swept down from the east and north. They destroyed many of the better things that had existed under

A page from the Books of Kells. This beautifully illuminated manuscript of the four Gospels in Latin was made by Irish monks in about 800 A.D. It is one of the finest examples of Celtic art that survives, and is one of the rare examples of civilization to come out of the Dark Ages.

the Romans. When they finally settled down, little was left of the civilization which they had plundered.

The second reason for calling this age 'dark' is that few records (which might have helped us discover what happened) were written; and the raids destroyed many of those that were.

Charlemagne, Alfred of England, and Otto I of Germany all tried to recover and rebuild the lost civilization of Rome. These were false starts. Arabs and other Islamic peoples kept attacking from the south; Saxons and Magyars harried eastern Europe; and the Vikings from the Scandinavian countries came again and again in their longships, raiding all the western coasts. They even reached Sicily and Italy.

The Church invented the monastery as a refuge to preserve something of the Christian life and culture that there had been under the later Roman Empire.

Reading and writing continued in the monasteries: in them some of the old authors' books were saved, studied and copied. When the churches and monasteries were destroyed in one area, enough survived elsewhere for missionaries to return to a fresh start after the worst was past. In the simple cells of the Irish monks, Greek was still taught after it had been lost over much of Europe.

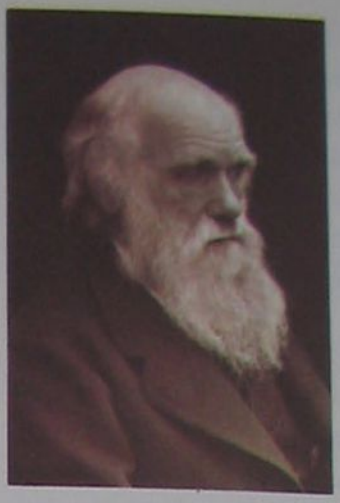
At this time the unconquered Eastern Roman Empire had a far higher standard of civilization than the West. But both were outshone by the greater civilizations of Asia, in India and China. About the eleventh century a lasting recovery began. To what the Church had saved was added borrowings from the Arabs. Much of the lost knowledge of the Ancient Greeks was found again. On these foundations the richer life of the Middle Ages was built.

Darling River is the longest river in Australia. Fed almost entirely by the rains of southern Queensland and north-eastern New South Wales, it rises in the Great Dividing Range and the Darling Downs. It then flows southwestwards for 1,700 miles to Wentworth, in New South Wales, where it joins the Murray. The Darling has many tributaries, which rise in a great 700-mile arc from Bathurst to just south of Bourke. Together they drain an area of more than 250,000 square miles. In dry years the lower Darling is merely a chain of separate water-holes.

The Darling was discovered in 1829 by Captain Charles Stuart. It was named after Sir Ralph Darling (1775-1858), a former governor of New South Wales.

Darwin, Charles Robert (1809-1882), was an English biologist whose theories shook the scientific world. They also had great impact on the general public.

In 1859 he published a book called *On the Origin of Species by Means of Natural Selection.* The book described



Darwin in later life. He was a keen scholar until his death in 1882.

his views that plants and animals were not just created exactly as they were found. His idea was that all living things reached their present form by gradual change, or *evolution.* (See Evolution.)

This theory was not new, other scientists having previously tried to put forward similar ideas. Darwin, however, put all his theories in such a clear way that the public was able to understand him much more easily.

As a young man Darwin studied both medicine and theology, but his real love in life was natural history. When he was 22, he was offered the post of naturalist aboard a survey ship. He eagerly accepted. The voyage lasted five years and took Darwin round the world.

During this voyage, Darwin was able to study a great number of animals and plants. And he gradually arrived at an idea which could explain how evolution works. He realized that living things are always competing and struggling with each other to survive. He also realized that members of a species vary among themselves, and he reasoned that some would be better equipped to survive than others. The plants or animals that survive best, are the most likely ones to breed, and so their offspring will be equally well equipped for survival.

Darwin's views on the origin of Man were unpopular with many people, including Church leaders, who thought that they were blasphemous. Darwin thought that Man was descended from 'A hairy quadruped, furnished with a tail, probably arboreal (tree living) in its habits'.

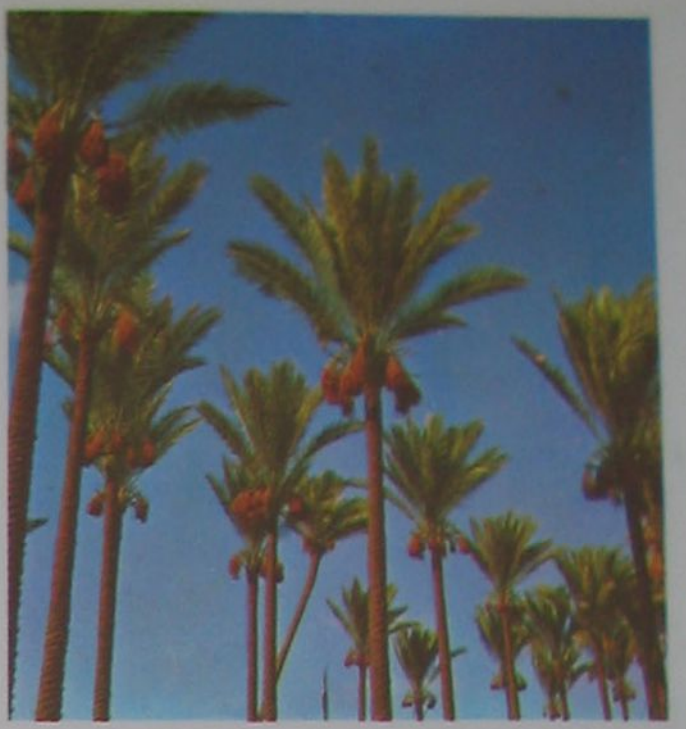
We can take the giraffe's long neck to illustrate Darwin's ideas. The early giraffes must have had short necks like the related antelopes, but suppose a few had slightly longer necks than the others. Those with longer necks would benefit because they could reach more food. These giraffes would survive and breed. Their offspring would also tend to have long necks and the whole population would gradually evolve long necks. Earlier naturalists could not explain how a giraffe grew a long neck, but Darwin showed that it was quite a natural process, and he called the process *natural selection.*

Darwin's theories on evolution became accepted by other world scientists. There was a considerable uproar, though, when he published his book called *The Descent of Man and Selection in Relation to Sex.* This put forward his theories that man also is evolved from lower animals, and was not created as such. Even today, there are people who cannot accept his views on this subject.

Darwin is the capital and port of the Northern Territory of Australia. It is situated on the shores of Port Darwin, an inlet of the Timor Sea. Its population is 33,000.

Darwin, a hot, humid city is an important communications centre. For this reason it was bombed by the Japanese in World War II. Apart from possessing the only navigable harbour in the Northern Territory, it has air links with New Zealand, Asia and Europe. On land, the Stuart Highway ('The Bitumen') connects Darwin to Alice Springs, some 1,000 miles to the south. The Barkly Highway runs east to Queensland. Darwin exports cattle and hides, and imports consumer goods and petroleum.

Port Darwin was named after the naturalist, Charles Darwin, by John Lort Stokes in 1839. The town that eventually grew up there was called Palmerston. It was officially renamed Darwin in 1911.



The date palm is vital to desert dwellers. It needs less water than any other food crop.

Date palm This is a tree that produces small, brown, sticky fruits called dates. Date palms grow in hot, dry tropical countries, particularly in the Middle East and northern Africa. The world's leading date-producing country is Iraq.

Date palms grow to a height of up to 100 feet. The leaves that fan out from the top of the trunk can be used to make rope, mats and baskets. The trunk itself can be used as fuel and as wood for building. The fruit is borne in large clusters at the top of the trunk. It develops from flowers. Only female palms produce the fruit. Male palms produce pollen that fertilizes the flowers on the female palms.

When the fruit is ripe, it is often harvested by a man shinning up the tree, secured only by a rope passing around his waist and the tree-trunk. One palm tree may yield up to 200 pounds of dates. The dates can be eaten fresh or dried, or they can be cooked or allowed to ferment and be made into an alcoholic drink.

David is regarded as Israel's greatest king. His story is told in the Old Testament of the Bible (*I* and *II Samuel* and *I Kings*). When only a shepherd boy,

he killed the Philistine giant, Goliath, with a stone from a sling. David succeeded Saul as king about 1012 B.C. He reunited the tribes of Israel and established Jerusalem as their capital. He died in 972 B.C.

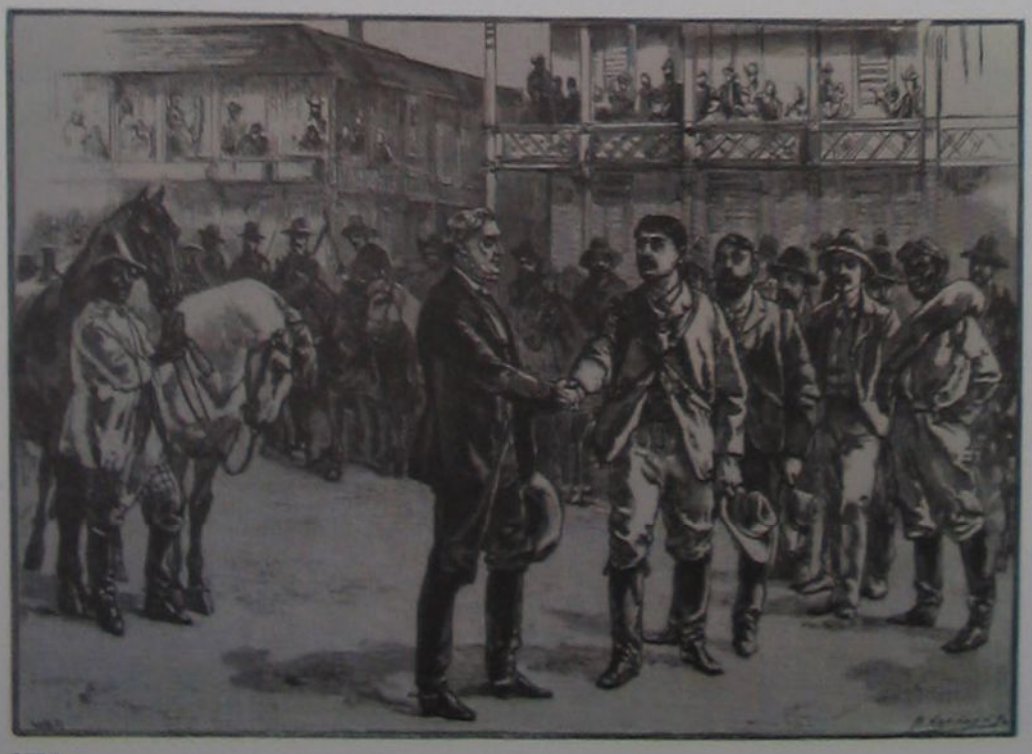
Davis, Jefferson (1808-1889), was a patriot of the South during the American Civil War. He served as president of the *Confederacy*, the break-away government formed by the southern states when they left the Union in 1861. Davis strongly influenced the way the South fought. General Robert E. Lee, commander of the Confederate forces, surrendered in 1865 to the *Union* (northern) forces, and soon afterwards, Davis was taken prisoner.

Davis was born in Kentucky and graduated from the U.S. Military Academy (West Point) in 1828. Before entering politics, he was a wealthy plantation owner and a hero of the Mexican War. He first became a U.S. Senator for Mississippi in 1847. In office, Davis argued that slavery should be extended in the free territories.

Davy, Sir Humphry (1778-1829), an English chemist, is credited with isolating seven of the chemical elements. He also invented a safety lamp that coal miners could use without fear of causing an explosion, and that warned them if dangerous gases were present.

Sir Humphry Davy, the English chemist, with one of his inventions, the miner's safety lamp. The Davy lamp greatly reduced the danger to miners from explosions of underground gas.

Davy took up chemistry when he was 19, and his early experiments were on the anaesthetic, nitrous oxide or laughing gas. In 1801 he was invited to lecture at



Left: Jefferson Davis (with beard), president of the Confederate States during the Civil War (1861-65), bids farewell to his escort at the end of the war. Two days later, Union troops captured Davis.

the Royal Institution in London. In 1807 he separated the elements sodium and potassium from their compounds by *electrolysis* (the breaking down of a compound by passing an electric current through a solution of it). In later experiments he isolated barium, calcium, magnesium, boron and strontium.

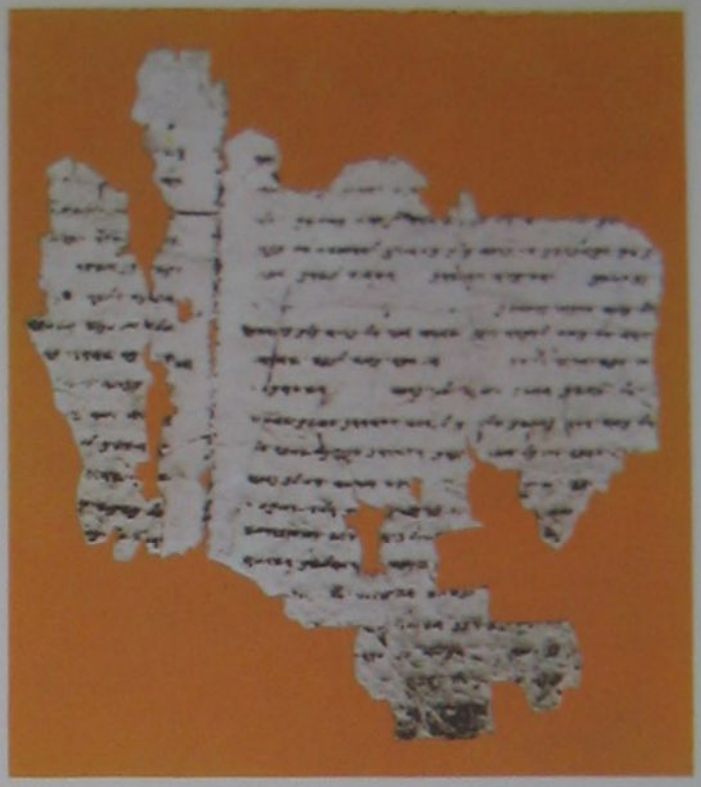
Dead Sea Lying between Jordan and Israel, the Dead Sea covers about 400 square miles. The Dead Sea lies about 1,300 feet below the level of the Mediterranean Sea, in a deep rift valley, formed between parallel *faults* or cracks in the Earth's crust.

The River Jordan flows into the Dead Sea, but the sea has no outlet. The hot sun causes a high rate of evaporation and the water level does not vary much. Large amounts of salt in the sea make it the saltiest sea in the world. People can float easily on its surface. But few plants and no fish can live in it.

Dead Sea Scrolls These are manuscripts discovered in the Qumran Caves near the Dead Sea in Jordan. Many finds have been made and we now have thousands of scrolls and fragments.

The scrolls, which were stored in jars, date from between the first century B.C. and the early first century A.D. They include a copy of the book of Isaiah almost a thousand years older than any previously discovered manuscript of the Bible. Fragments have been found of most books of the Old Testament.

Other important scrolls are connected with the Qumran sect which hid them.



A fragment of one of the Dead Sea Scrolls which were accidently discovered in 1947 after remaining hidden for almost 2,000 years.

They include a rule-book called the *Manual of Discipline* and an allegorical work called *The War of the Sons of Light with the Sons of Darkness*. Some scholars believe that the sect was the Essenes, a strict and puritanical community.

A shepherd is said to have found the first Dead Sea Scrolls in 1947. Scholars are still studying the thousands of fragments, some of which throw new light on Jewish and Christian beliefs.

Deaf and dumb language is a method of communication used by people who are deaf or dumb. Unlike ordinary speech, it depends on sight, not sound. It is sometimes called *sign language* because

The Standard Manual Alphabet is widely used by deaf and dumb people to communicate. The letters shown here are A, D, P and R. The system is based on making the shape of the written letter with the hands.

hand signs and gestures are used to express about 1,600 common words and phrases. Other words are spelled out using an alphabet of 26 finger positions. This means of communication began in the 1600's and was used in a famous school for the deaf founded in Paris in 1775.

Deciduous trees are those that shed their leaves at the end of each growing season and grow new ones at the beginning of the next. Deciduous trees are most common in the temperate lands of the northern hemisphere. They are found in a band across the northern face of the globe, between coniferous forests to the north and tropical rain forests to the south. Common deciduous trees include oak, ash, beech, elm, birch, alder, maple and horse-chestnut.

Deciduous trees have thin, broad leaves that lose water readily. Consequently, they can live only in areas where rainfall is plentiful. By dropping their leaves in winter they prevent the loss of too

Some common deciduous trees showing the winter outline together with leaf forms and some fruits.

Deciduous trees in autumn in Burnham Beeches wood in Buckinghamshire, England. In the autumn, the leaves of deciduous trees turn brown and eventually fall. Beech woods like this have little undergrowth.

much water at a time when the soil is cold and water might be hard to get.

Leaves are shed in the autumn. The chlorophyll breaks down and the leaf's green colour disappears to reveal the yellows and reds of other pigments—the autumn colours. The walls of the cells where the leaf stalk joins the branch dissolve away, and the leaf hangs limply from the tree, attached only by its conducting veins. Soon, the wind snatches it away. Meanwhile, cork cells have grown on the stem side, plugging the leaf scar with waterproof material.

The kinds of trees that dominate a deciduous woodland depend upon the soil. Chalk and limestone soils give rise to beech and ash woods, while acid soils are characterized by oak or birch. But no matter what kind of tree dominates, a deciduous forest almost always consists of three distinct layers, at least at some part of the year. The trees themselves form the first layer. Beneath these comes the undergrowth. This is made up of bushes and small trees. Finally comes the ground-flora, of herbaceous plants.

The composition of undergrowth and ground-flora varies with the type of tree which dominates. Oak woods often include in their undergrowth hazel, hawthorn, brambles and honeysuckle. The ground-flora commonly include primrose, wood anemone and lesser celandine. Beech woods, on the other hand, have a sparse undergrowth and ground-flora because they cast a deep shade. The undergrowth may include wayfaring trees, dogwood and old-man's beard. The ground-flora may include dog's mercury, woodruff and enchanter's nightshade, together with a carpet of ivy.

It is no accident that most of the flowers growing in deciduous woodlands—bluebells, primroses, wood anemones, lesser celandines—bloom in the spring. These plants grow early before the trees develop their leaves and blot out the light.

Declaration of Independence When war broke out between Britain and her American colonies in 1775, it was the aim of the colonists to make Britain rule more wisely and give them more freedom. However, in 1776 representatives from the thirteen colonies, meeting at a congress in Philadelphia, decided they must break away from the British Empire altogether. They wrote down their reasons for doing this in the Declaration of Independence, signed by their President, John Hancock, on 4th July, 1776.

The Declaration was written in simple but stirring language by Thomas Jefferson from Virginia. One thing it said is that everyone has the right to enjoy 'life, liberty and the pursuit of happiness', it also said that rulers who do not give this freedom are breaking an agreement with their people and must be overthrown.

Such ideas helped the Americans to win independence and to decide what sort of government they wanted. (See Independence, American War of.)

Deep-sea fishes live at depths of 2,000 to 20,000 feet in the ocean. At these depths, it is completely dark to the human eye, the temperature is just above freezing, and the ocean currents are very slow. The animals of this dark, cold, still world have developed strange forms and habits which enable them to survive.

Few fishes are found below 20,000 feet. Except at the greatest depths, deep-sea fishes have sensitive eyes and nearly all of them produce their own light. The light organs are arranged in patterns along the body, and as each species has its own pattern, they serve as recognition signals, helping the fishes to find mates and food. Some lantern fishes have a large light organ above or below the eye which illuminates their surroundings.

Some of the fishes which inhabit the depths of the oceans. They are the pale cynothone (top left), a hatchet fish (top right), a gulper (bottom right), a crocodile lantern fish (bottom left) and a lynophryne (centre).

Food is scarce at great depths. Plant life does not exist below a depth of about 500 feet, where the light becomes too weak for plants to survive. Deep-sea fishes are therefore *carnivorous* animals with efficient ways of feeding. Their mouths are often gigantic, with rows of razor-sharp teeth. But the fishes themselves are rarely more than a foot long. Many of them attract prey to their mouths by means of a lure attached to their heads. This often takes the form of a feeler with a luminous knob at the end. The dragon fish can stretch its stomach to consume prey six or seven times its own size. Prawns and other fishes are the main foods of deep-sea fishes.

The strangest deep-sea fishes are the angler fishes. From six inches up to three feet long, they swim about the bottom, a luminous lure projecting above their mouths. This lure can be moved about, or switched on or off. Any fish or crustacean that comes near is swallowed in a gulp of the huge jaws, with their rows of scimitar-like teeth. The female deep-sea angler fish is several hundred times larger than the male, which remains attached to the female's body all its life. The male's only function is reproduction —all its other organs have become useless and it is totally dependent on the female for nourishment.

A Cape Breton fawn.

Deer are graceful hoofed animals that have horn-like antlers on the heads of the males. Deer can run quickly and jump gracefully. They have long slender legs ending in two hoofed toes. Deer are *ruminants*—that is, they chew the *cud* (regurgitated food) before finally swallowing it.

The antlers of deer are not true horns. They are not covered in horn, and they divide into branches. A new pair of antlers grows each year in the spring and summer. They have a bony core and, at first, a soft velvety coating of skin. When the antlers are fully grown, this skin peels off, exposing the bony core. In the mating season—usually autumn—rival male deer fight duels with their antlers. Later, the deer shed their antlers.

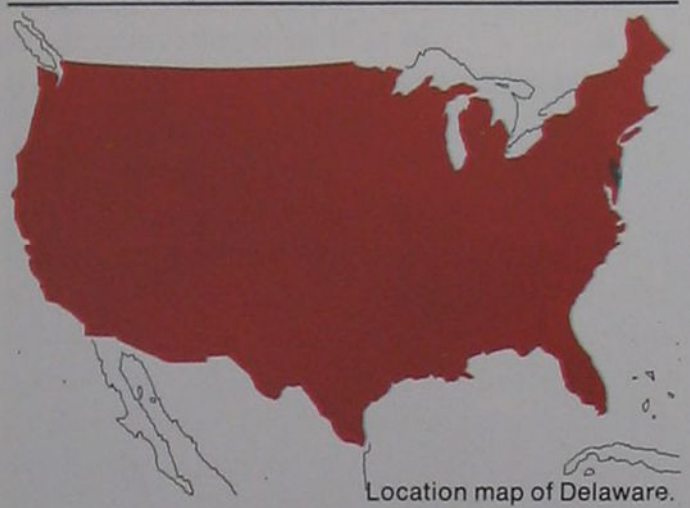
Red deer stags fight amongst themselves for the hinds (females) during the autumn. Only the males have antlers.

Deer are important to man, providing meat and hides. They are by far the most numerous of all the larger wild animals, in spite of their being hunted. Deer live in all parts of the world except central and southern Africa. Australasia has only deer that have been introduced by man.

In northern Scandinavia, the Lapps use reindeer to pull sledges, and to provide meat, leather, and furs. Some of the natives of North America used to hunt the closely related, but bigger, caribou.

The biggest of all deer is the moose of North America, which is called the elk in Europe and Asia. This animal stands six feet high at the shoulder and weighs half a ton. Americans use the name 'elk' for the wapiti, another large deer. This is one of the red deer, one of the main groups of deer, which live in much of Europe, Asia, and northern Africa, as well as America. Also common are the much smaller roe deer.

The extinct prehistoric giant deer, which lived in northern Europe 50,000 years ago, had horns that measured 14 feet across. The smallest living deer in the world is the mouse deer of south-east Asia. A fully grown adult weighs only 7lb and stands 10 inches high at the shoulder.



Location map of Delaware.

Delaware, on the mid-Atlantic coast of the United States, was one of the 13 original states of the Union. It is the second smallest state, and has a population of 548,000. Important as an industrial state, Delaware is also known for its farms and fisheries. Dover is the state capital, and Wilmington the largest city and chief port.

Most of Delaware lies in the Atlantic Coastal Plain, and is generally flat. But the north-west has low, wooded hills. There are many rivers.

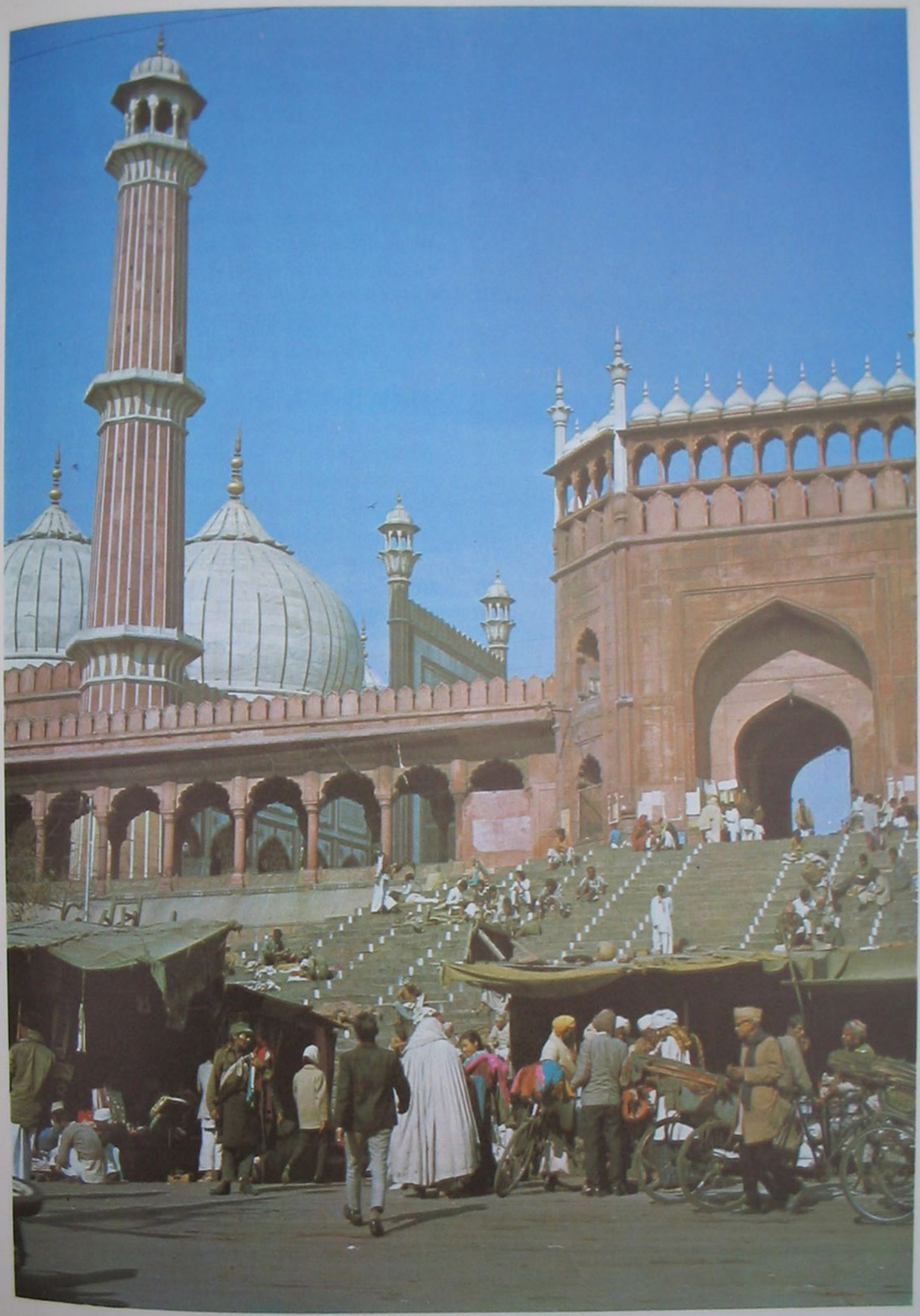
Because of Delaware's favourable laws and low taxes, many large companies have their head offices in the state. Chemicals are the leading product. Delaware also produces clothing, food products, machinery, textiles, and rubber, leather and plastic goods. More than half of Delaware is farmland. Poultry, cattle, pigs, dairy products, maize, potatoes, wheat and mushrooms are among the chief agricultural products.

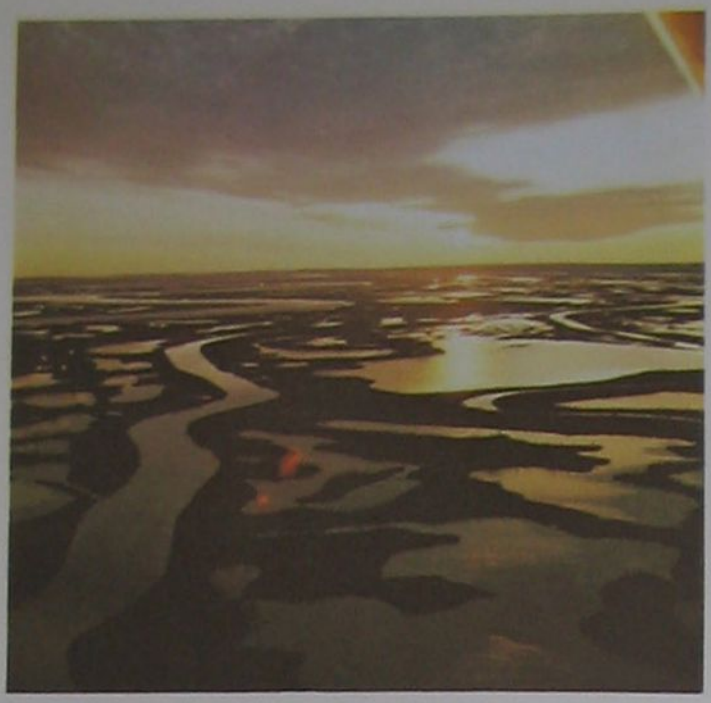
Delaware was colonized by the Dutch and Swedes in the 1630's, and was taken by the English in 1664. Colonists from the area took a notable part in the American War of Independence. Delaware became the first state to accept the United States constitution.

Delhi (pop. 3,630,000) is the capital city of India. It is situated within the Union Territory of Delhi on the Jamuna river. It consists of two parts. Old Delhi is an ancient walled city rich in monuments of the great Mogul rulers. New Delhi, founded in 1912 when the seat of government was transferred from Calcutta, is a well-planned city with modern buildings and broad tree-lined avenues. In addition to its administrative function it is an important trade centre. The Red Fort of Emperor Shah Jahan, with marble pavilions and splendid inlaid work, was once the most magnificent palace in the East.

Delta As a river ages, it wears away its banks by erosion. Its valley becomes very wide and flat, forming what is called a *flood plain.* In the case of a very old river, the flood plain is extremely wide at the mouth of the river, and consists almost

Crowds gather outside the 17th century Pearl Mosque in Delhi. Built of white and grey marble, the Temple was for the Shah's private use.





The delta of the Mackenzie River, the largest river of North-Western Canada.

entirely of the river's own deposits.

The river may divide and subdivide into many branches, which fan out across the plain. The outermost branches of the river enclose a large triangular area around the river mouth called a *delta*, after the Greek letter Δ.

The delta consists of many small islets of mud, separated by the river's many channels. The courses of these minor streams are constantly changing, dividing or swamping some islands, and forming new ones elsewhere.

The best-known example is probably the delta of the River Nile on the north coast of Egypt. Other rivers having large deltas are the Amazon in Brazil, the Mississippi in the United States, the Volga in Russia, and the Ganges and Brahmaputra in India and Bangla Desh.

Democracy The best form of government for most people is one that they can choose for themselves. Such a government is called a *democracy*, from the Greek words for 'rule of the people'. A great American president, Abraham Lincoln, asked his fellow citizens to ensure 'that government of the people, by the people, and for the people, shall not perish from the earth'. This is the ideal description of democracy. But democracy is a difficult form of government and it can be inefficient. A democracy may prove weak when attacked, as was France in 1940. A democracy may not be able to concentrate on developing its wealth. India, a democracy, has been less efficient in industrializing than many Communist countries.

In a democracy, however, the people can change the government if they come to see that it is failing. In countries with two or more parties and free elections, people can vote out of office people with whom they disagree, replacing them with others from another party. So the party whose policies are liked by most of the voters comes into power. (See Elections; Political Parties.) This cannot happen in a one-party state.

One-party states are not always dictatorships, however. If there is some freedom of speech and there are powerful organizations like trade unions or churches, the government can be criticised and may alter its policies. This was happening in Communist Czechoslovakia in 1968 when the Soviet army invaded the country to prevent democratic changes.

Talking Points

*The first democracy was in Athens in the 5th century BC. Every male citizen had a say in the government and could make his views heard. Do you think that this type of democracy would work in modern times?

*If Abraham Lincoln's definition of democracy is true, then everybody who is allowed to vote should be able to influence the actions of the government. Do you think this really is the case?

*Compare the democratic system of government with other systems such as absolute monachy, dictatorship and communism. What advantages does democracy have over them?

Articles to read

Communism and Socialism; Constitution; Elections; French Revolution; Government; Greece, ancient; Local Government; Magna Carta; Monarchy; Parliament; Political Parties.

Denbighshire, a county in North Wales, borders the Irish Sea. Its county town is Denbigh, and its population is 184,800.

The Berwyn Mountains in the south-east contrast with the fertile valleys of the Clwyd, the Conway and the lower Dee. Farmers raise cattle and sheep in the north. Agriculture is more general

in the south. Coal, lead and zinc are the chief minerals.

Ruthin is the administrative centre of the county. Llangollen and Colwyn Bay are tourist resorts, while Wrexham is the main industrial town.

Denmark, a small nation in northern Europe, is one of the world's leading dairy farming countries.

The country consists of Jutland, a peninsula lying between the North Sea and the Baltic Sea, and a number of islands. The wide channels of the Skagerrak and the Kattegat separate the mainland from Norway and Sweden. But one of the largest islands, Sjaelland, is only 2½ miles from the Swedish coast. Copenhagen, the capital, is on Sjaelland. Germany lies south of Jutland.

The whole of Denmark is less than 600 feet above sea level, but the land has low, rolling hills. Sand dunes line the west coast. Denmark has warm summers, but temperatures drop to freezing point during winter. The rainfall averages only 25 inches a year.

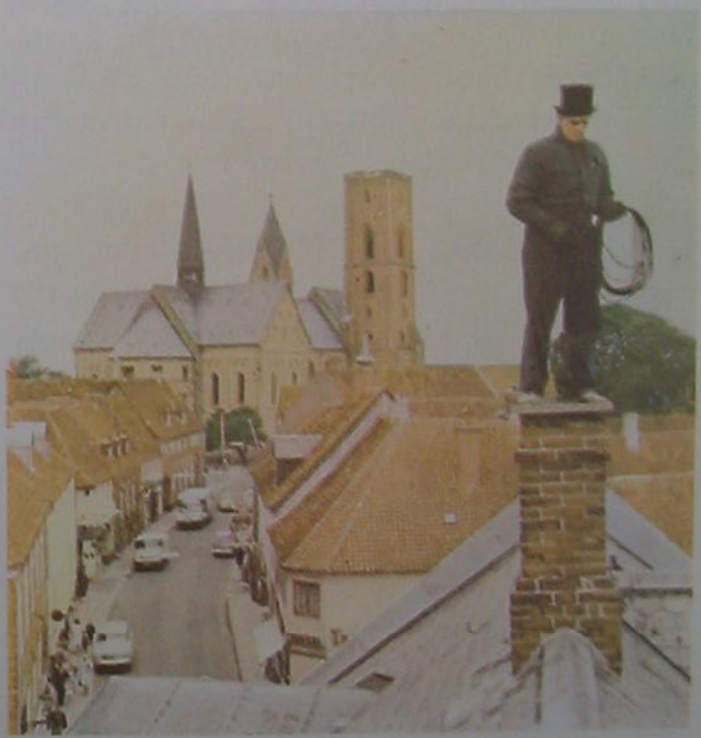
Denmark has few natural resources. It has few minerals or forests, and some of the soil is of poor quality. Using modern scientific methods, the Danes rear great numbers of cattle, pigs and poultry. Danish farmers cultivate three-quarters of the land, and grow food crops for the animals.

Denmark exports bacon, dairy produce and beef. Its manufacturing industries, using imported raw materials, produce one-third of its exports. These industries now employ more people than farming. Fishing is another important industry.

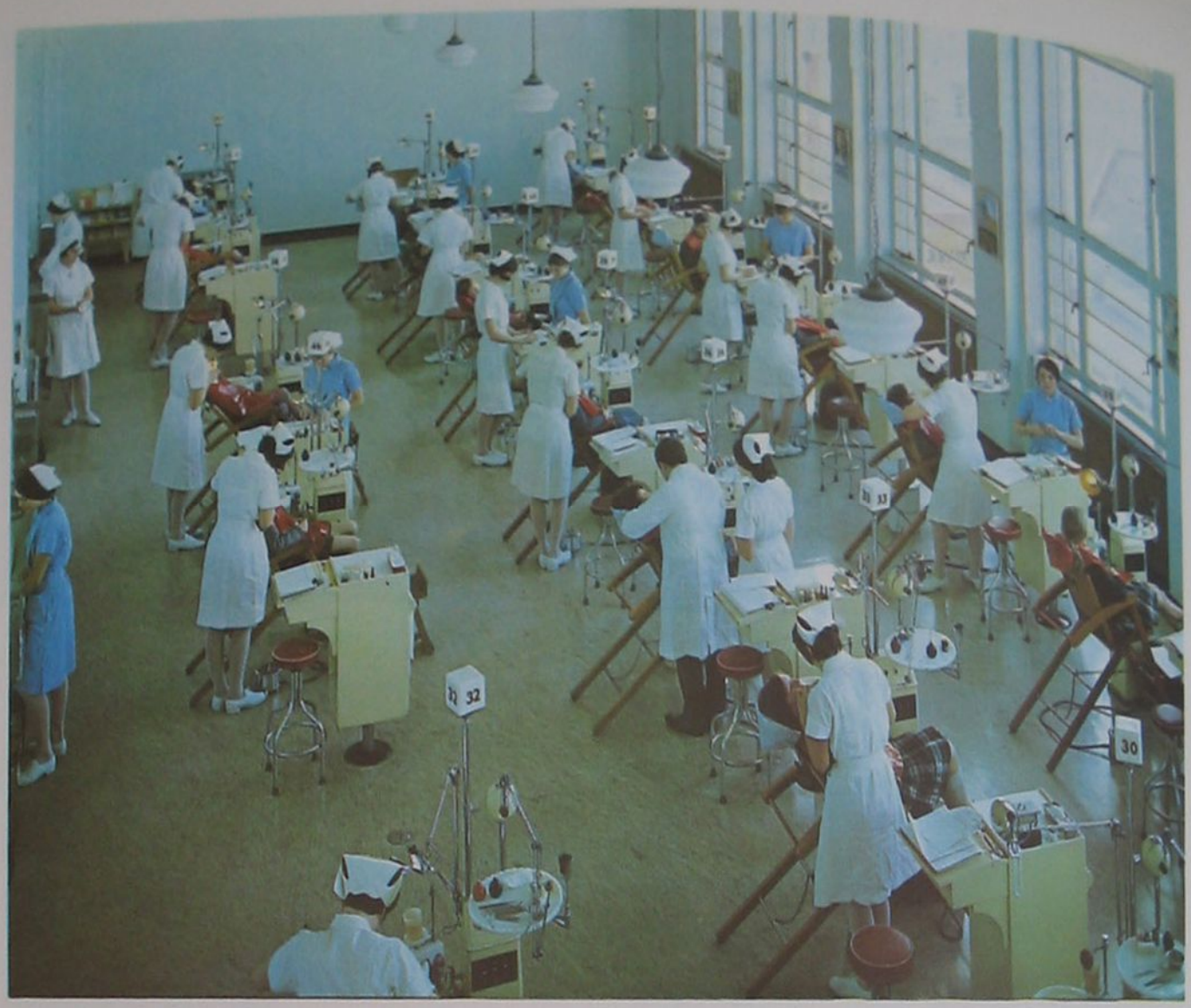
Vikings settled in Denmark about 2,000 years ago. During the A.D. 800's, the Vikings raided many parts of Europe. They settled in northern England and in Normandy, in France. During the next 1,000 years, Danish kings several times won empires, but lost them again. From 1940 to 1945, when the Germans conquered it, Denmark lost its independence

Facts and Figures
Area: 16,619 square miles.
Population: 4,900,000.
Capital: Copenhagen.

Above: The Tivoli Gardens, one of Copenhagen's main tourist attractions.
Right: Location map showing the position of Denmark (black) in North-West Europe.



A Danish chimney sweep. His distinctive costume, complete with top hat, is traditional in several parts of northern Europe.



Children having their teeth treated in a modern dental clinic in Wellington, New Zealand. Each dentist has an attendant nurse and a battery of equipment with which to do his work.

for the first time since Viking days. Denmark became a member of the European Free Trade Association in 1960. In 1973 Denmark joined the European Common Market.

Dentistry is the branch of medicine concerning the teeth and the mouth. A dentist takes care of your teeth by preventing disease and decay, by making sure that your teeth are placed as correctly as possible, and by making new teeth or parts of teeth to replace missing ones. In many countries surgery on the jaw is also carried out by dentists.

People must visit a dentist regularly to keep their teeth in good condition. Children should go before they get their permanent teeth, so that the dentist can keep an eye on their progress and correct them by plates or other appliances if they are badly out of place. The dentist examines a patient's teeth to see if any are decaying. Sometimes he takes X-ray pictures to check if there is any decay. If he finds any, he will usually drill out the decayed part and fill the cavity left with soft metal. The best metal for this purpose is gold, but it is expensive and so an alloy is more commonly used. Before he drills a tooth, or pulls one out, the dentist will numb the area with local injections.

The dentist also checks his patient's mouth for any signs of disease. He can often stop it from becoming serious if he sees it in time. He also cleans away the chalky white deposit that builds up on teeth. Today this work is sometimes done

by less highly qualified people called dental hygienists.

Dentistry is a very old craft; some well made false teeth have been found in Egyptian tombs. During the Middle Ages it died out as a science—the remedy for an aching tooth was to have it pulled out. The first recognition of dental surgery as a profession was in France in 1700, and soon dental schools were founded. The development of anaesthetics made an immense difference to dentistry.

Depression Business depressions are periods in the life of a country when many workers are unemployed, factory machinery is not fully used and business activity is at a low ebb. People buy fewer goods, because they have less money to spend. For many years, economists have recognized that depressions tend to alternate with *boom* periods of prosperity, when employment is high and factories are in full production.

Experts do not agree about the cause of depressions or the best remedies. Some say depressions occur when not enough money is invested in business, or when people spend too little money on manufactured goods, with the result that factories have to cut production. Others say the reason is a rapid change in the amount of money held by banks—if everyone decides to withdraw money at the same time, it upsets the economy. Governments try to reverse depressions by controlling interest rates, and by increasing government expenditure to make up for the fall in private spending.

In December 1930, there were over 2½ million unemployed in Great Britain. The worst hit areas were the north-east and the mining valleys of south Wales. The unemployment pay was £2·37½p per week for a married man with children. By September 1932, 7 million people were living on the 'dole'.

The *Great Depression* was a severe and world-wide depression that began in the United States in 1929. It spread to Britain and the other countries of Europe, which were still weak as a result of World War I. It lasted through most of the 1930's, and created great hardship for hundreds of thousands of people.

Derbyshire, an inland county in the English Midlands, is famous for the caves and picturesque hills in the north. Its county town is Derby, and its population is 638,300.

The north-western part of the county, known as the Peak District, includes the

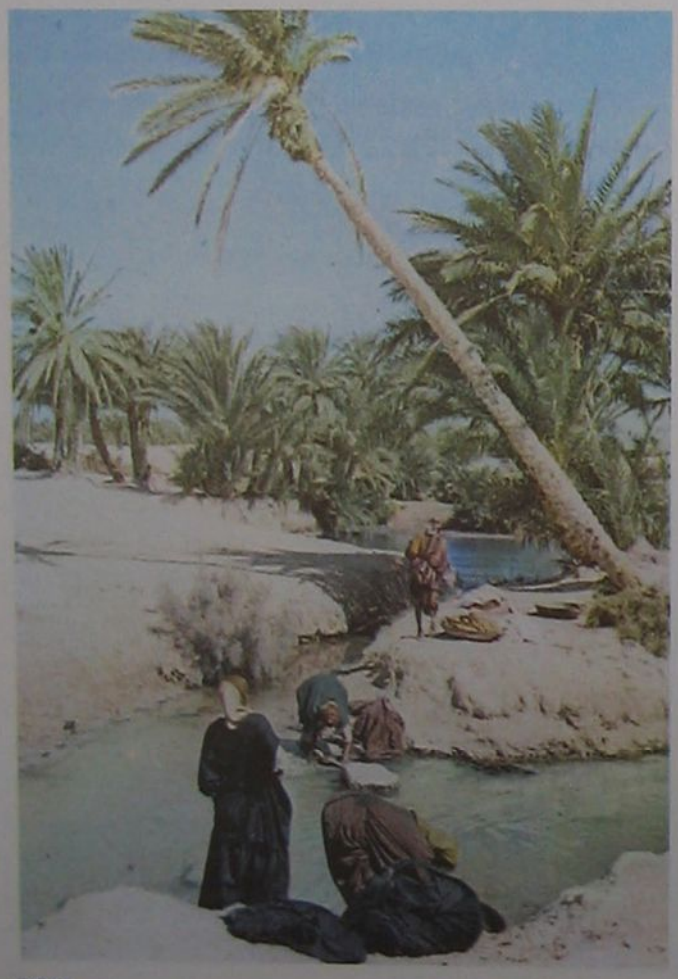
The 'Jarrow Crusade', 1936. Two hundred unemployed shipbuilders marched to London from Jarrow on Tyneside to protest over the government's inability to solve the economic crisis of the depression. The north-east of England was one of the hardest hit areas during the depression of the 1930's; in Jarrow itself 70% of workers were out of jobs. Although conditions were improving throughout the country as a whole by 1936, hardship continued in the north-east for some years afterwards.

southern end of the Pennines. Derbyshire is drained by the Derwent, Dove, Trent and Wye. Farmers rear sheep in the hilly districts, and dairy cattle in the gentle lowland plains of the south and east. The main industries are coal mining, limestone quarrying, iron smelting, textiles and engineering.

Spas have been built to take advantage of the warm mineral springs at Matlock (the administrative centre), Buxton and Bakewell. The area of Derbyshire is 1,005 square miles.

Descartes, René (1596-1650), was a French philosopher and mathematician. He lived in the Netherlands for much of his life. Descartes' philosophy is called *Cartesian philosophy*. His argument supporting the existence of God and the physical world starts from the simple deduction: 'I think, therefore I am.' His most famous book is the *Discourse on Method* (1637).

In mathematics, Descartes devised rules of algebra and geometry, including a useful method of plotting geometrical

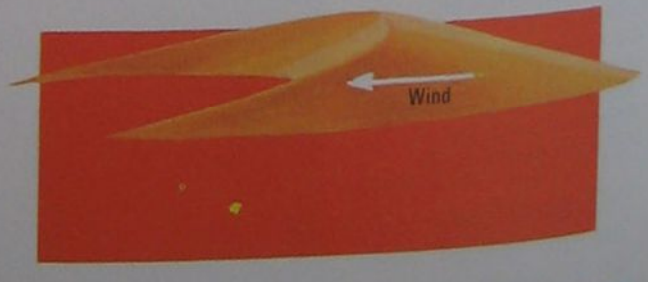


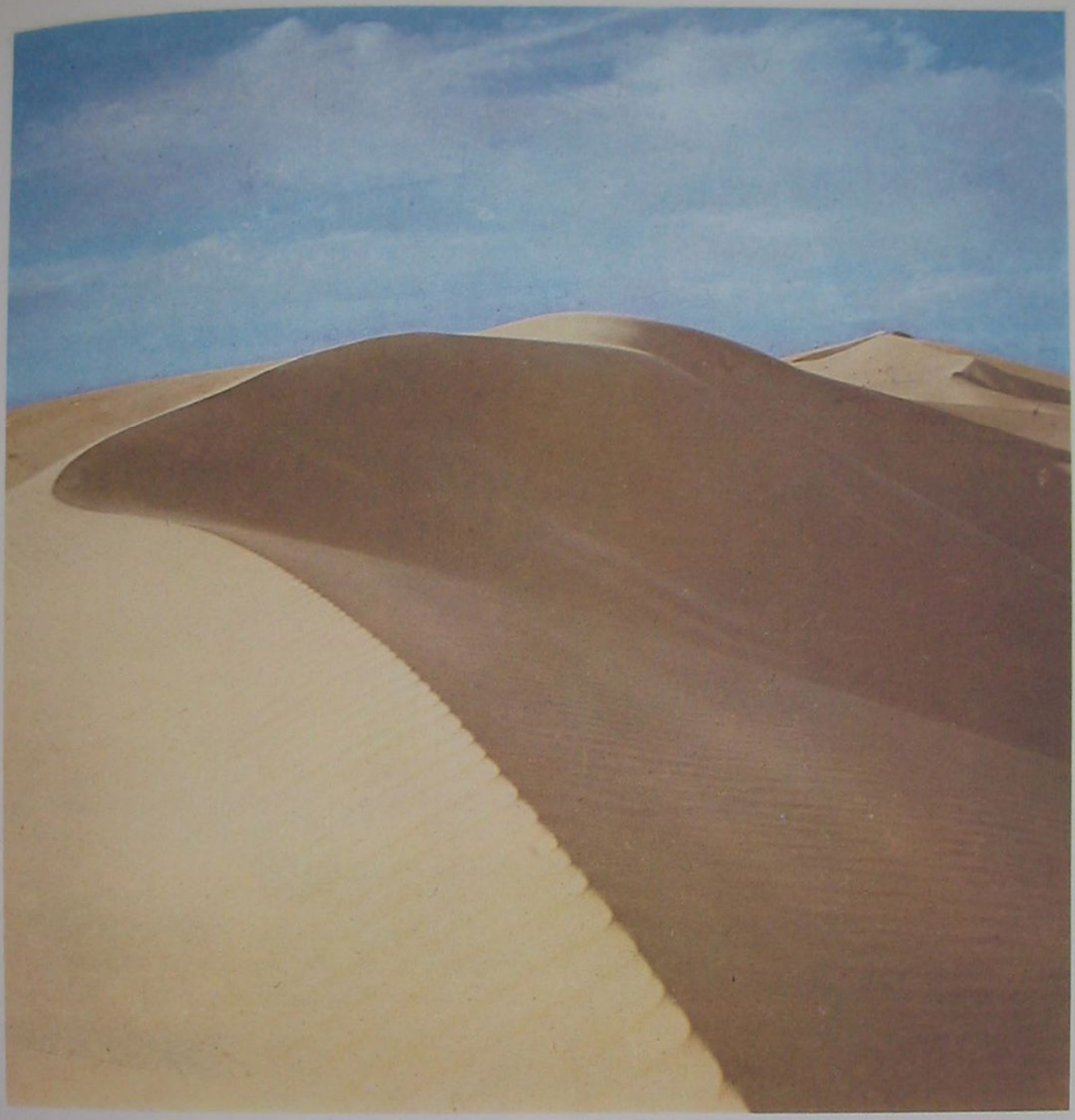
Above: Most of the world's great deserts lie in the trade wind belts, where winds moving towards the Equator are warmed and tend to pick up moisture rather than shed it. Other deserts lie in the shadow of mountain ranges which rob rain-bearing winds of their moisture. The largest desert is the Sahara, with an area of 3,500,000 square miles. The most arid desert is the Atacama in South America, parts of which have had no measurable rainfall since records began.

Left: An oasis in the Sahara. Oases range from mere waterholes to the densely populated Nile Valley.

Right: Deserts are often pictured as shifting 'seas' of sand dunes like these. But this is only in parts. Much of the Sahara, for instance, is a rocky waste.

Below: In sandy deserts the wind forms crescent-shaped dunes called barchans.





points on a graph known as *Cartesian co-ordinates*. He also published books on optics, physiology, psychology and music.

Deserts Areas of the world with almost no rainfall, and which also experience extremes of heat and cold, are called deserts. The vast ice areas of the North and South Poles are deserts in a sense, but the name is more usually given to huge dry areas found in the middle of continents.

The Earth's desert belt stretches from the Sahara in Africa across Arabia to the Gobi desert of Central Asia. Beyond the Himalayan mountains in north-western India is the Desert of Sind. There are huge deserts in North America, east and south of the Sierra Nevada mountains, and also in the western regions of South America, in south-western Africa (Kalahari), and Australia (Victoria and Sandy).

Deserts are generally found in the middle of continents, because winds from the sea have lost all their moisture by the time they reach the centre. The extreme dryness of these regions is intensified between mountain barriers, and desert

basins are created, such as the Tarim Basin in China and the Great Basin in North America. There are very great differences in temperature between day and night, and summer and winter, in all these regions. The sun's heat is taken up very quickly by the dry soil, but after sunset the soil gives up heat equally rapidly and the temperature quickly drops.

At certain intervals, often years apart, rain does fall and plants spring to life. Though plant and animal life is sparse, few deserts lack some life, owing to the great adaptability of living things. Bushes develop enormously long roots, and plants evolve that do not lose water by evaporation, such as the cactus.

Desert animals can travel long distances without drinking or eating. Camels, for example, have padded feet to walk on sand, and are able to store food in their humps, and water in their stomachs. Some of the smaller desert animals such as the jerboa and gerbil require little actual water, but get moisture from the plants and seeds that they eat. During the daytime they live in burrows to escape the fierce heat, coming out to feed at night. Snakes also live in deserts. They obtain liquid from the small animals that they hunt and eat.

Human beings living in deserts are mainly *nomads* (wanderers), who drive their animals from one grazing or watering area to another. Settlements are usually found only where there are wells, or *oases* (rare pools of water surrounded by trees and bushes).

Deserts are often rich in minerals: gold is found in Australian deserts; oil in Arabia and the Sahara; and *nitrates* (chemicals that can be used as fertilizers) in Chile.

Talking Points

*Make a list of all the animals and plants that live in desert regions. Find out and discuss the special qualities they have that enable them to live in conditions in which ordinary animals and plants would die.

*A large proportion of the world's land surface is desert. What measures do you think could be taken to turn the deserts into fertile land that could be used to grow food?

*How do you account for the extreme changes in temperature between day and night in the desert?

Articles to read

Cacti; Gobi; Irrigation; Oasis; Sahara.

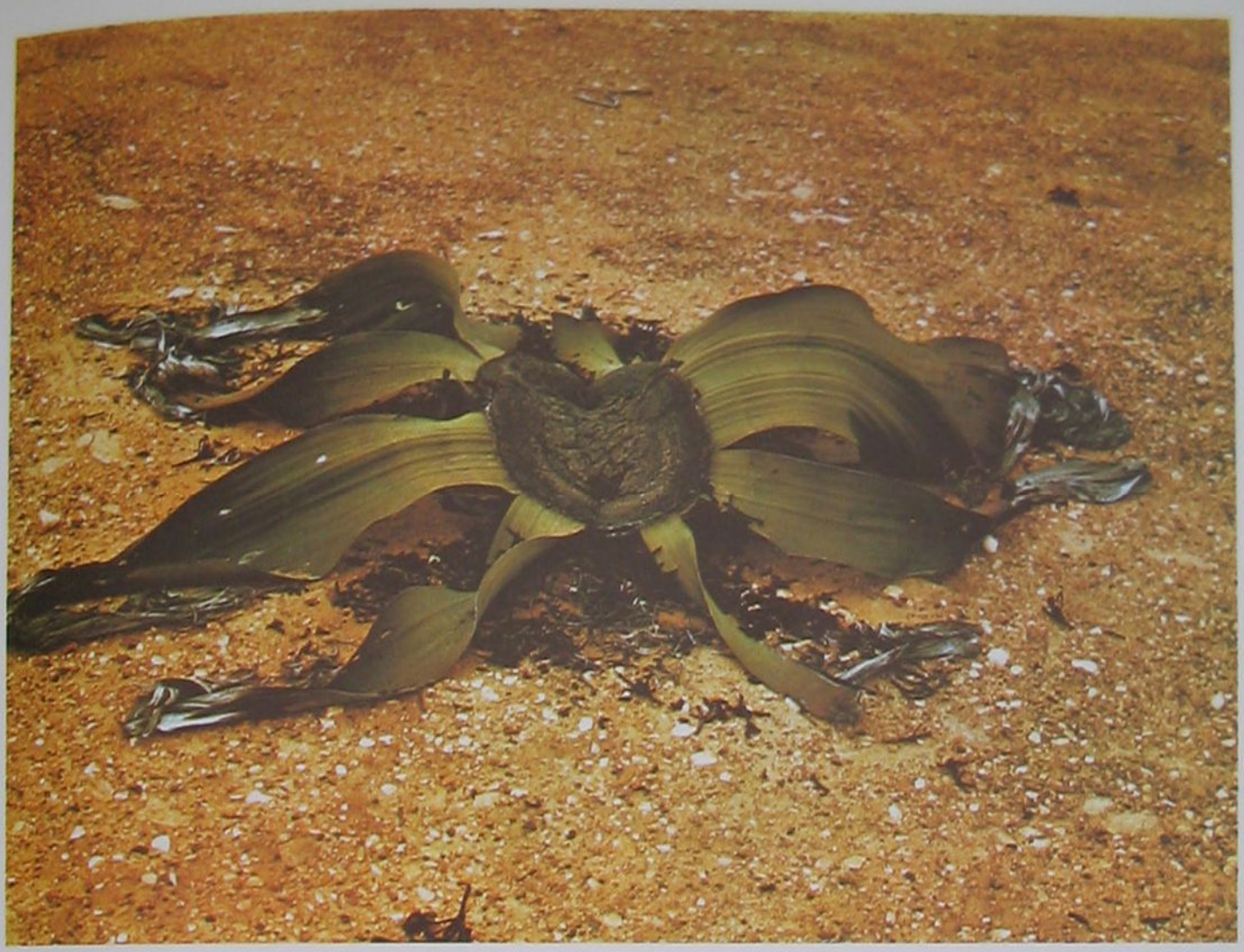
Detroit, the largest city in the state of Michigan, is the fifth largest city of the United States and one of the most important car manufacturing centres in the world. About a quarter of the cars made in the United States come from the Detroit area. The city lies on the Detroit River which separates the United States from Canada. The river also connects Lakes Erie and St Claire. Detroit's position on the waterways of the Great Lakes has made it become one of the busiest inland ports in the world. With its suburbs, Detroit has a population of 3,760,000.

Besides cars, Detroit produces steel, soap, paints, chemicals, business machinery and glass. The city has many museums, an orchestra and several universities. Nearby Dearborn has the Henry Ford Museum of industrial history.

Detroit was settled originally by the French in 1701. It was the capital of Michigan until 1847.

De Valera, Eamon (1882-), became president of the Republic of Ireland in 1959. One of the leaders of the 1916 Easter

Eamon de Valera is one of the few revolutionaries to make a successful transition to politics. A leader of the Irish fight for independence, in 1973 he was still president of the Republic of Ireland.



Above: The desert plant *Welwitchia mirabilis*. This plant grows only in the desert of Mocamedes in Angola.

Right: A gerbil. Gerbils live in the deserts of south-west Asia and of Africa. They need little water and feed on seeds and leaves. Their long tails and powerful hind legs enable them to hop about like a kangaroo. When a gerbil gets excited, it beats its back legs on the ground, making a drumming noise.

Cut and polished diamonds on a 'shovel' before being sold to a jeweller. The main diamond markets in Europe are in Amsterdam and in the famous Hatton Gardens, London.

Rebellion in Dublin, De Valera later led the minority Republican group that opposed the treaty setting up the Irish Free State. In 1926, he founded *Fianna Fail*, a political party which won the election of 1932. He headed the government from 1937 to 1948, 1951 to 1954 and 1957 to 1959. De Valera was born in New York City, but was educated in Ireland and became a mathematics lecturer.

Devonshire, often called simply Devon, is a county in the south-west of England, between Somerset and Cornwall. Its county town is Exeter, and its population is 896,200.

The county's bold scenery is made up largely of rugged hills and moors: Exmoor in the north-east, the Blackdown Hills in the east and Dartmoor in the south. The chief rivers are the Taw, Torridge, Tamar, Exe, Dart and Teign, most of them flowing through wooded valleys. The apples that produce the famous cider are grown in Devonshire's fertile red earth. Clotted 'Devonshire' cream is produced on many dairy farms.

Tourism is the main industry, with resorts such as Torquay, Paignton, Sidmouth, Lynton and Barnstaple. Plymouth and Devonport are important naval bases.

Dew is the moisture that coats objects near to the Earth's surface, such as stones and blades of grass. On a still, clear night, such objects lose the heat they have gained from the Sun by day. The air next to the objects is also cooled, until it reaches its *dew point*. This is the temperature below which the air is unable to hold all of its moisture in the form of water vapour (which is a gas). Below the dew point, water vapour begins to *condense*—that is, it turns back into a liquid, in the form of water droplets. These droplets are deposited as dew. In some parts of the world, dew provides more water than rain.

Diamonds are a crystallized form of the element carbon formed inside the Earth millions of years ago by intense heat and pressure. Diamonds are the hardest natural substance known. Because of their great rarity and beauty, colourless, transparent diamonds are considered the most precious of jewels. The larger and more perfect the stone, the greater its value. Skilled craftsmen cut *facets* (polished surfaces) into diamonds to make them sparkle. Today, most *gemstone* diamonds come from South Africa.

Many diamonds have flaws or chemical impurities that make them yellow, green, brown or even black. Such diamonds are used in industry for making scraping and cutting tools and drills.

Dickens, Charles (1812-70), an English novelist, was the most popular writer of his time. He cared deeply about the

sufferings of the poor, especially children, and in his novels attacked the injustices they endured. He also created some of the most humorous and lively characters in English fiction.

Dickens was born in Portsmouth, the son of a government clerk. His childhood was spent in poverty, and when he was ten his father was sent to the debtors' prison of Marshalsea. Dickens had to spend miserable months working at a blacking factory. He later drew on his unhappy experiences to provide the background for some of his books.

Dickens taught himself shorthand, and in 1835 became a reporter of parliamentary debates for the *Morning Chronicle*. He also contributed to other periodicals articles that were later republished as *Sketches by Boz*. The *Pickwick Papers* followed, in twenty monthly instalments, which immediately established Dickens as a successful writer. In 1836 he married Catherine Hogarth.

In 1842, after completing several more of his books in serial form, Dickens visited America, where he advocated the abolition of slavery. At Christmas time, 1843, *A Christmas Carol* appeared, the first of several Christmas books, which he continued in subsequent years with *The Chimes* and *The Cricket on the Hearth*.

In the next few years he travelled widely in Europe. Shortly after the appearance of *David Copperfield* in 1849-50, Dickens started the weekly periodical *Household Words*. He replaced this magazine by another very similar one in 1859, *All the Year Round*, which he continued to edit until his death.

He began public readings from his books in 1858, which he continued during his second visit to America in 1867-68.

Charles Dickens was a charitable man and among other things, he promoted schools for poor children and a loan society to help poor people to emigrate to Australia. Most of Dickens' books were published in serial form at monthly intervals. One of the few failures in his life was in 1846, when he started a newspaper called The Daily News *which he edited for only two weeks before giving up the struggle.*

Left: Detail from a contemporary portrait of Dickens.

Below: Mr Pickwick and Sam Weller from an illustration of Dickens' most famous characters.

Although these readings were very popular, they undermined his health, and he died in 1870, leaving his last story, *The Mystery of Edwin Drood*, unfinished.

Dictionaries are reference books that list words in alphabetical order and give their meanings. They also provide information on spelling, pronunciation and *etymology* (the derivation of words). There are also specialized dictionaries, such as dictionaries of chemistry and dictionaries of art. Another type of dictionary translates the words of one language into equivalent words in another. Because languages are constantly changing, dictionaries must be revised from time to time, to keep-up-to-date. Dictionary making is called *lexicography*.

The first English dictionary, called a *Table Alphabeticall*, was produced by Robert Cawdrey in 1604. In 1755 Samuel Johnson published a two-volume diction-

ary that is famous for its wit and scholarship. The most ambitious work was the *Oxford English Dictionary*, published in 1928. It took 44 years to compile. Noah Webster (1748-1843) was America's most influential lexicographer.

Diet is the selection of foods that a person, animal or group normally eats every day. People in different parts of the world have widely different diets, depending on what foods are available, what the climate is like and what traditions of cookery the people have developed. Diet may be affected by other factors, too, such as religion. For example, Muslims do not eat pork.

To be healthy, we must have a diet that provides enough food energy to sustain the body. This energy is measured in *Calories*. If we do not get enough Calories we starve. Too many Calories, on the other hand, leads to overweight, a common problem in rich countries.

The foods that make up our diet must be properly balanced—that is, they must contain *proteins* (milk, eggs, meat, fish and cheese), *fats* (oils, butter, margarine), and *carbohydrates* (sugar or starch). Poor people often have diets that are lacking in proteins, because protein foods are expensive.

A balanced diet should also contain *vitamins* and *minerals*, without which people get deficiency diseases such as rickets or scurvy. Vitamins and minerals are found in a number of foods: milk contains calcium; green vegetables and carrots contain vitamin A; whole grains and liver contain a number of B vitamins; and citrus fruits are rich in vitamin C.

Digestion Animals need food to carry out all their living processes, including growth, reproduction and movement. Every cell needs to receive a constant food supply. But food cannot be used just as it is eaten. It must be able to reach all parts of the body, and it must therefore be broken down into a form that will pass through the cell membrane. The process by which this is done is called *digestion*.

Even in simple, one-celled animals that have no bloodstream, such as the amoeba, food must be digested. No cell could use, say, a piece of meat or potato, even if it could be carried round the body. Digestion, then, consists of more than simply breaking the food up into small enough pieces. It involves converting it into simpler chemical substances.

In all but the simplest animals, digestion takes place in the *alimentary canal*, or *digestive tract*. This is basically a tube that extends from the animal's mouth, which takes in the original food, to its *anus* or *cloaca*, which expels the unwanted matter. Part of the alimentary canal is twisted and coiled, so that it is much longer than the animal itself. In man, for example, it is about 30 feet long. This gives the food plenty of chance to be digested and absorbed into the body.

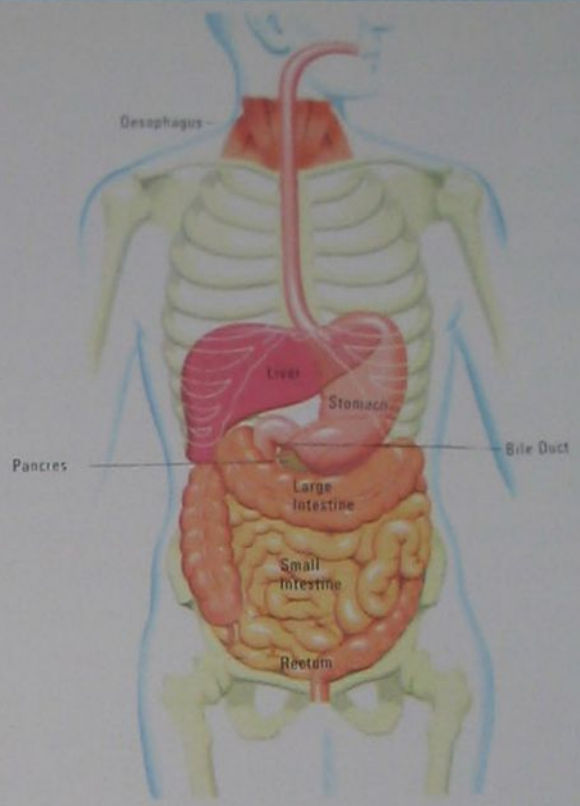
There are three basic kinds of substances in food that need digestion: *carbohydrates*, such as sugar and starch; *proteins*, such as meat and fish; and *fats*. Chemical substances called *enzymes* are mixed with the food in the alimentary canal and break down these three groups in different ways. The products can all dissolve in the blood. Other parts of food—vitamins and minerals—are not broken down, because the body uses them in their natural form.

Digestion begins in the mouth. The teeth break the food into small pieces and mix it thoroughly with saliva. An enzyme in the saliva starts converting any starch in the food into sugar. After being chewed, the food is swallowed, and passes down a tube called the *oesophagus* into the stomach. Muscles in the wall of the oesophagus force the food down. The stomach produces another enzyme, which starts to break down proteins. The stomach also contains hydrochloric

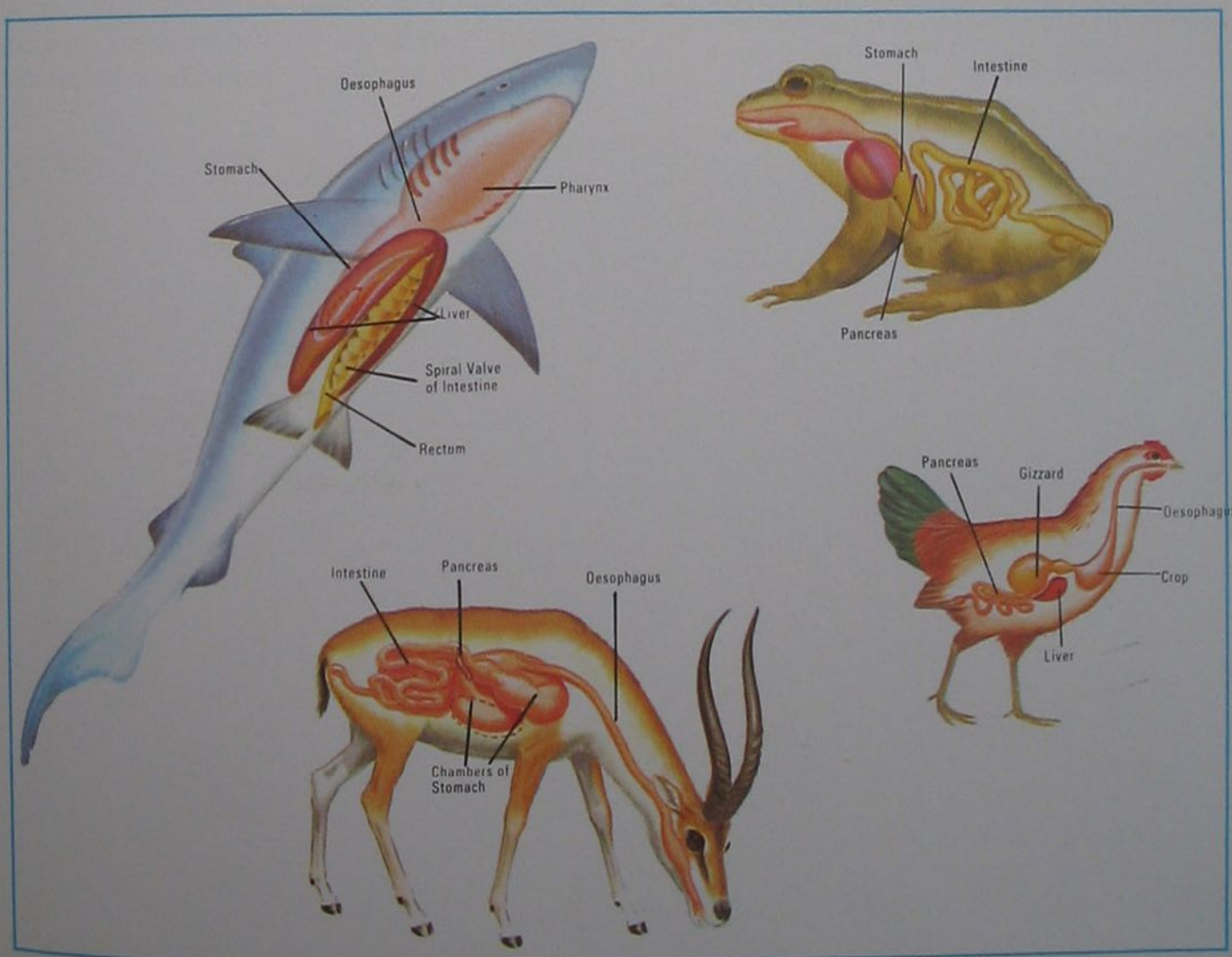
acid, which makes this enzyme active. A second stomach enzyme *clots* (solidifies) the protein in milk. This is particularly important for babies, who rely on milk for food.

After several hours, the paste-like and partially digested food enters the *small intestine,* where the chemical breakdown is completed. Many digestive juices containing enzymes are released there, from the walls of the intestine itself and from the *pancreas.* The liver produces a liquid called *bile,* which breaks fats down into tiny droplets. Enzymes from the pancreas break down these fatty droplets as well as proteins and carbohydrates.

Tiny finger-like projections from the intestine wall absorb the digested food from the half-liquid mass. They are called *villi.* Blood vessels carry the food from the villi to the liver, which passes enough food to the body for its needs and stores



Above: The human digestive system.
Below: The digestive systems of a fish, an amphibian, a bird and a ruminant mammal.



the rest until required. The undigested food from the small intestine passes into the shorter but wider *large intestine*. There the undigested food loses water and becomes more solid. Finally, this waste is eliminated from the body through the anus as *faeces*. (See Enzymes; Food.)

Dikes and levees are the world's oldest and most widely used method of flood control. They consist of wedge-shaped walls of earth, stone, concrete or other strong materials built a short distance from the banks of a river or the seashore. The purpose of the wall is to prevent the rising water from spilling over on to the surrounding countryside and towns.

The term *levee* is a general one for such embankments. It comes from the French word *lever* (to raise). Dikes are a special kind of levee that have been constructed, particularly in the Netherlands, for centuries. There they were first built to keep the sea from flooding the country, much of which lies below sea level. Later, they were used to reclaim land from the sea and make it usable for farming and other productive purposes. Such reclaimed lands are called *polders*.

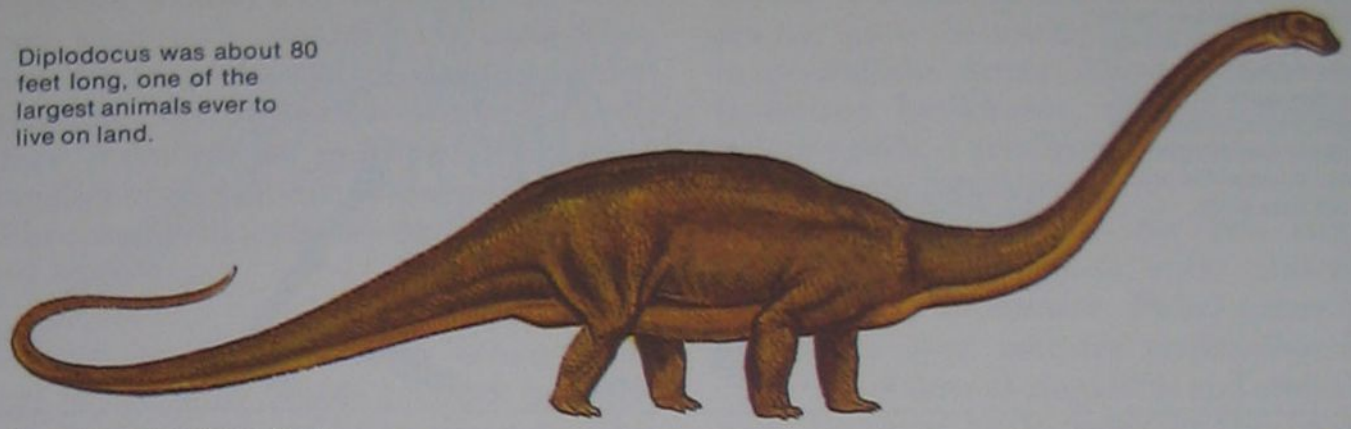
With all their experience, the Dutch have naturally become masters of dike engineering. But disastrous floods still occur from time to time. Because of this, the work of strengthening and repairing the dikes is a never-ending one.

Some rivers produce natural levees along their banks during periods of flooding. The water, moving more slowly along the banks than in mid-channel, deposits large quantities of mud and silt on the banks. When the floodwaters go down, sloping levees remain.

Levees are always built with a wide base to give them strength. For extra height, sandbags are sometimes placed on top. A terrace is sometimes built on

A view of the 20-mile-long Great Dike which protects the Zuider Zee from the tides and waves of the North Sea. The Dutch have been reclaiming land from the sea since the 1200's. These areas are called *polders* and are created by building dikes and then draining the water from behind them.

Diplodocus was about 80 feet long, one of the largest animals ever to live on land.



Styracosaurus was a plant-eating dinosaur. He was armed with a powerful horn.

Stegosaurus was a plant-eating dinosaur who was protected by rows of bony plates on his back and spikes on his tail.

the landward side to prevent rainwater from carrying too much earth down the sloping surface. Grass is usually planted on the levee for the same purpose.

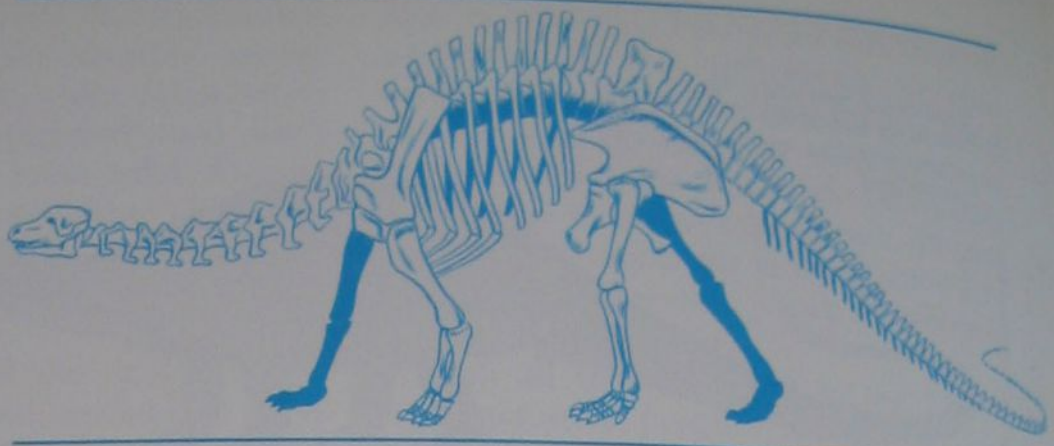
Levees have been constructed on the Danube, Vistula, Po and other rivers of Europe. Some famous levees were built along the lower Mississippi River in the United States, beginning in 1718.

Dinosaurs, 'terrible lizards', were animals which lived on Earth millions of years ago. They were reptiles—cold-blooded land animals, which laid hard-shelled eggs containing both food and protective fluid for their unborn young. They were the distant relations of our modern lizards, turtles, snakes and crocodiles.

During the Mesozoic era, or 'Age of Reptiles', the dinosaur was king. More than 5,000 different kinds of dinosaurs lived then. Most were plant eaters *(herbivores)*, but a minority were meat eaters *(carnivores)*.

Tyrannosaurus was the most terrifying of the dinosaurs. He stood almost 20 feet high. He could run with huge strides on his massive hind legs and use his dagger-like teeth to attack his prey.

A reconstructed skeleton of Brontosaurus, a huge plant-eating dinosaur. Brontosaurus probably spent much of his time partially submerged in water to ease the weight of his vast body.



The earliest meat-eating dinosaurs walked on their hind legs. They were small and light, about as big as roosters. Some may have eaten reptiles even smaller than themselves. Others ate eggs, and it has been suggested that their speed would have been very important to them in running away from angry parents.

Gradually, over millions of years, some of these meat-eaters became terrifyingly large and strong, with sharp teeth and claws. They were ferocious creatures. *Tyrannosaurus rex*, the 'King of tyrants', stood 20 feet high on great, muscular hind legs. His gigantic skull contained many sharp teeth, each six inches long. His small front feet had a vice-like grip, and were armed with sharp claws. *Tyrannosaurus rex* could jump and run at great speed. No living creature was safe from his attack.

As a protection from the savage meat-eaters, many plant-eating dinosaurs grew fantastic armour: horns, spikes, and solid bony plates. *Triceratops* in motion must have looked like a cross between a rhinoceros and a tank.

Some plant-eating dinosaurs grew to be the biggest land animals the world has ever known. They had no armour plating, but their strength gave them some protection. *Brachiosaurus*, the giant of them all, weighed 50 tons—that is, more than ten elephants—and was as high as a three-storey building. His cousin *Brontosaurus*, the 'thunder lizard', was also huge. From the tip of his long, powerful tail to the front of his ridiculously small head, he measured more than 70 feet. He had a massive body, trunk-like legs, and an enormously long neck. His joints were ill-adapted for supporting him on land, so that his days were spent standing placidly in swampy water, eating about one ton of marsh plants at a meal! Despite his huge size, the brain of *Brontosaurus* was little bigger than an egg. All dinosaurs had small brains, and they were rather clumsy and stupid animals.

No man has ever seen a dinosaur. Only their skeletons, footprints, and other fossil evidence remain. Approximately 70 million years before man appeared on Earth, the last of the 'terrible lizards' died out. Perhaps this was because the Earth was growing colder and swamps began to dry up, reducing the dinosaurs' food supply. Perhaps the cold itself was too much for them to endure.

Diplomacy is the art of conducting negotiations between nations. Countries with interests in common—in trade or defence, for example—negotiate treaties setting out the points on which they are agreed. Countries in conflict try to settle their differences by negotiation instead of by war.

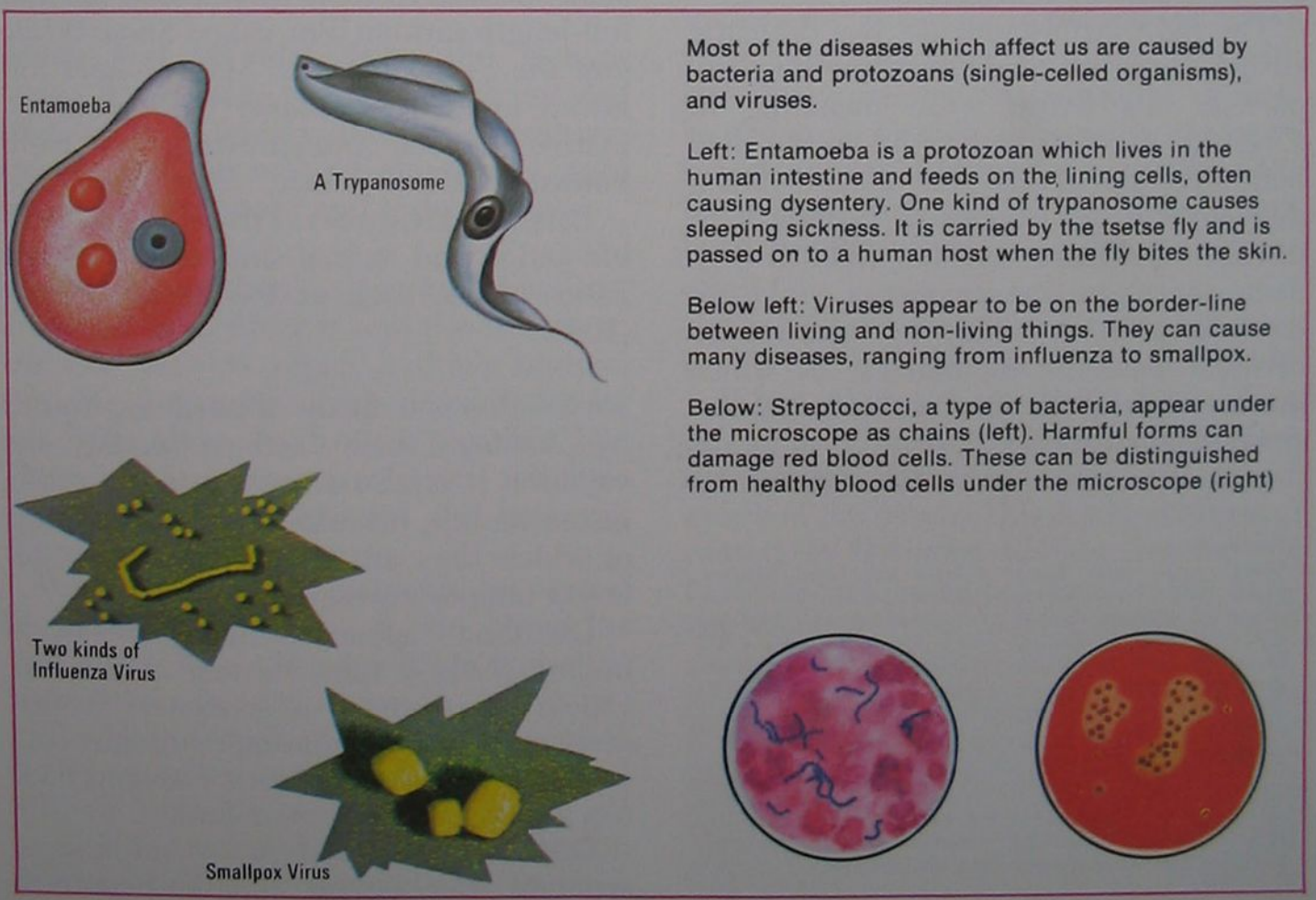
Each country has a diplomatic service whose members, called *diplomatists* or *diplomats*, act as its representatives in dealings with other countries. Diplomatists live in the capital of the country to which they are assigned, keep in touch

with that country's government and watch over their own country's interests. They also act as a channel of communication between the two governments. Their office is called an *embassy*. The senior member of an embassy is the *ambassador*. Other ranks include *counsellor*, *minister* and *secretary*.

Disease, or illness, occurs when some part of the body ceases to work properly and an abnormal condition develops. This may be due to outside 'interference' in the form of tiny living creatures called *bacteria*. Some bacteria are helpful to man, but others are extremely harmful. These enter the body like an invading army. Once in the system, they multiply rapidly causing such diseases as tuberculosis, diphtheria, typhoid, and pneumonia. Some diseases are caused by viruses. These are minute, and cannot be seen without a very powerful microscope. Viruses are strange things, for they grow only when they are inside the tissues of a plant or animal. Outside, in the air or water, they do not grow or multiply and they exist in crystal-like forms. The common cold is caused by viruses; so are influenza, poliomyelitis, smallpox, measles, and yellow fever (see Virus).

Fungi and protozoa are two larger sorts of invaders whose entry into the body results in disease. Fungi generally attack the skin, and are responsible for such complaints as ringworm and athlete's foot. Protozoa go to work in the bloodstream and other internal parts, causing numerous illnesses, such as malaria and dysentery.

Bacteria, viruses, fungi and protozoa cause what are called the *infectious diseases*. A different set of illnesses are the *endocrine disorders*. These result from the presence in the body of either too much or too little of a particular hormone. *Hormones* are chemical substances, manufactured by the body's endocrine glands. They regulate growth, digestion and various bodily functions. Diabetes



Most of the diseases which affect us are caused by bacteria and protozoans (single-celled organisms), and viruses.

Left: Entamoeba is a protozoan which lives in the human intestine and feeds on the lining cells, often causing dysentery. One kind of trypanosome causes sleeping sickness. It is carried by the tsetse fly and is passed on to a human host when the fly bites the skin.

Below left: Viruses appear to be on the border-line between living and non-living things. They can cause many diseases, ranging from influenza to smallpox.

Below: Streptococci, a type of bacteria, appear under the microscope as chains (left). Harmful forms can damage red blood cells. These can be distinguished from healthy blood cells under the microscope (right)

is the commonest endocrine disorder, resulting from a lack of the hormone insulin.

Hormones are not the only substances that must be present in the right quantities to prevent disease. A lack of vitamins may bring on one or more *vitamin deficiency* diseases. Vitamins are obtained from food. Fish oils, for example, are a good source of vitamin A. Without this vitamin, a condition called 'night blindness' ensues (see Vitamins).

Some diseases are simply the result of *old age*. The walls of arteries thicken or harden; bones become soft; joints grow stiff and painful. Another group, the *industrial diseases*, may result from the absorption of harmful substances into the body, or from a lack of proper lighting and ventilation in places of work. Lastly, many illnesses occur for no known reason. Scientists believe that they can identify a contributory cause of some cancers—irregular cell growths. But diseases like colitis and multiple sclerosis are still unsolved mysteries.

The fight against disease is a dramatic struggle, and its successes show how important this battle is to mankind. In England, in 1840, one child in six died before the age of one year. By the 1960's, due largely to advances in dealing with disease, the figure was one child in fifty. Such enormous improvements could not have been made solely by treating individual patients. Epidemics, in which diseases spread like fire, had to be understood and controlled. The causes of industrial disease had to be eliminated. The idea of *preventive medicine*, which is closely linked to the safeguarding of public health, developed largely over the last 150 years. Preventive medicine, as its name implies, aims to prevent illness before it takes root. The development of vaccination has reduced the occurrence of infectious diseases enormously.

Talking Points

*Fifty years ago, many people caught (and died of) dangerous diseases such as diptheria, smallpox, and tuberculosis. In the 1970's these diseases are very rare. Discuss why they have become so.

*When we are tired, cold or not eating enough of the right food, we are much more likely to become ill than if we are well-fed and healthy. Why do you think that this is so?

*There are some diseases like measles and mumps that we cannot catch once we have had them. Make a list of those that you know about, (ask your parents) and discuss the reasons for it.

Articles to read

Ageing; Antibiotics; Bacteria; Blood; Drugs; Glands; Hormones; Immunity; Innoculation; Medicine; Nursing; Surgery; X-Rays.

Disney, Walt (1901-1966), was an American film producer whose animated cartoons, and the fantasy world they created, delighted audiences everywhere. Disney began working with animation in the 1920's. He soon found the best way was to draw a separate picture for every movement of the characters, so that at film speed they would appear to move in a lifelike manner. This painstaking process requires thousands of drawings.

When Disney released the cartoon *Steamboat Willie* in 1928, its main character, Mickey Mouse (with Disney himself providing the voice) became an instant success. In 1938, he released the first full-length cartoon film, called *Snow White and the Seven Dwarfs*. Many others followed, including *Fantasia* (1940) an imaginative cartoon interpretation of well-known classical music. (See Cartoons.)

Later in his career, Disney made real-life action and animal stories, and superb nature films, such as the *Living Desert* (1953).

Distillation is a means of purifying liquids by boiling them and collecting the vapours. It is also a means of separating mixed liquids, because the various liquids of which they are made vaporize at different temperatures.

Distilling apparatus consists of a boiling flask, a tube through which the vapour is removed, a *condenser* (coiled section of tube running through cold water) where the vapour is changed back to a liquid, and a collection flask.

Distillation is used in oil refining to separate the lighter oils and petrols,

A scene from Walt Disney's feature length cartoon, Cinderella. The two ugly sisters and their mother go off to the ball, leaving Cinderella behind.

which boil off first, from the heavier ones. It is also used for purifying and concentrating whisky and other alcoholic spirits, and for making chemically pure water for laboratory and industrial use.

Diving When there is work to be done under water, a diver is sent down to do it. He may dive to repair a ship's bottom, examine a sunken wreck, or prospect for minerals. And men dive for pleasure, too. There are few more fascinating activities than exploring the strange and beautiful world beneath the sea.

When a diver descends into the water, he must be supplied with air. Using his own lungs, he could not remain under for more than a minute or two.

The *deep-sea diver*, who has to remain in the water for quite a while, is supplied with air from the surface through an air hose. He wears a rubberized suit with a copper breastplate and helmet. To keep him down, he has heavy weights around his waist and on his shoes.

The *skin-diver* uses a *s*elf-*c*ontained *u*nderwater *b*reathing *a*pparatus (SCUBA), such as an *aqualung*, to supply him with air. The aqualung was invented in 1943 by the great French underwater explorers Cousteau and Gagnon. Compressed air from tanks strapped to the diver's back lead through valves and tubes to his face mask.

The SCUBA diver wears rubber *flippers* on his feet to help him swim more easily.

When divers have been fairly deep down, they must not rise to the surface too quickly. Otherwise they will get an attack of the *bends*. This is a kind of cramp caused by nitrogen bubbles leaving the blood as the water pressure on the body decreases. At great depths, divers breathe a mixture of oxygen and helium.

The deepest dive in open water made by individuals without the help of a diving bell is 728 feet. This dive was made by H. Keller and K. Macleish in Lake Maggiore (between Italy and Switzerland) in 1961. The record descent made without the help of any breathing apparatus was by E. Maiorca. In 1971, he held his breath and dived to 250 feet in Sicily.

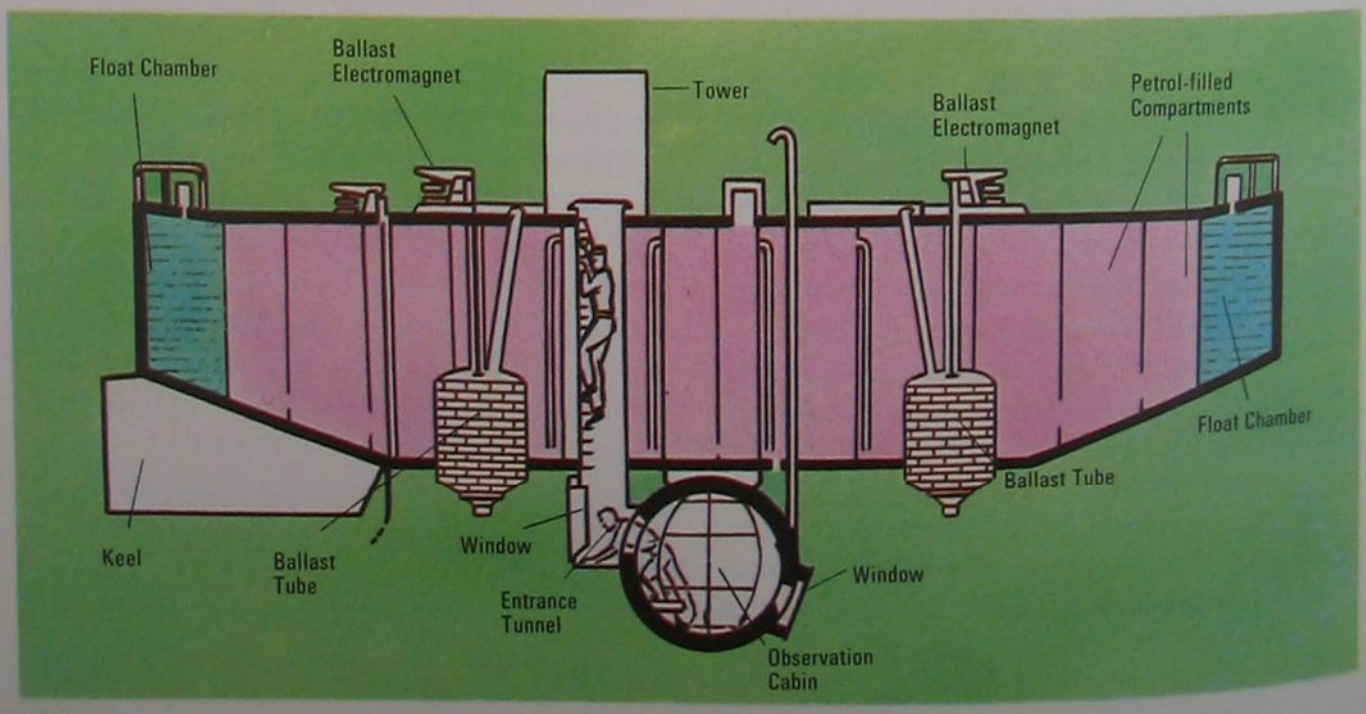
Most diving is done in under 200 feet of water, although the record dive stands at over 1,000 feet. But at that depth, the water pressure is tremendous.

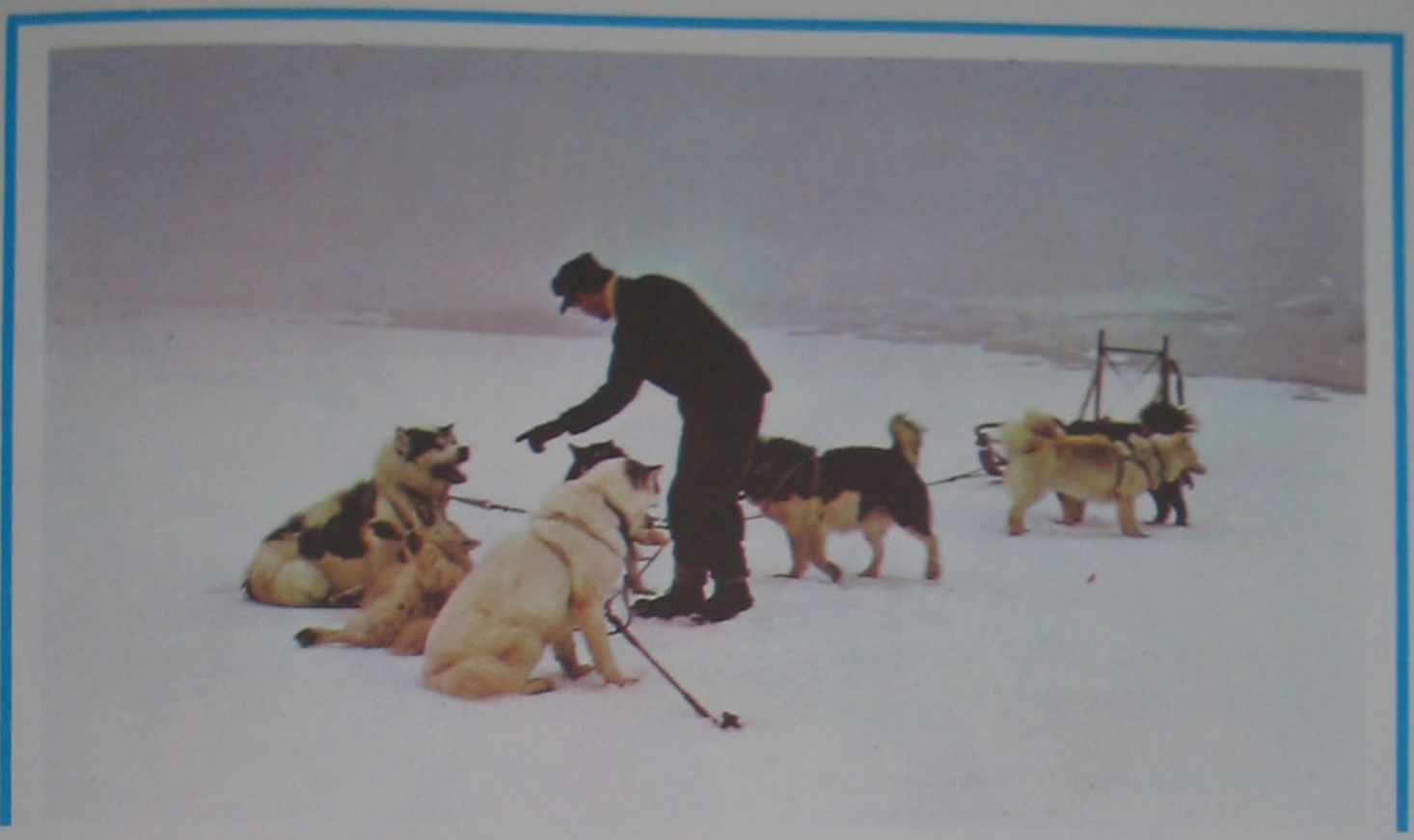
To descend farther, he has to be protected by a steel pressure vessel. One such vessel is the bathyscaphe *Trieste*, built by Auguste Piccard. *Trieste* descended almost 7 miles into the Pacific Ocean in 1960.

Djakarta, the capital and most important city of Indonesia, is situated on the north-west coast of the island of Java. It was known as *Batavia* until 1949 when Indonesia became independent of the Netherlands. Including its suburbs Djakarta has 4,750,000 inhabitants.

Djakarta is hot and often damp. It is situated in a low-lying and swampy area, and several canals run through the city. The old section has some Dutch-style buildings dating from the 1700's and 1800's, as well as colourful markets. It is the commercial centre. The new section has broad avenues lined with modern

Top left: A skin diver carries his own breathing apparatus.
Left: The deep-sea diver is supplied with compressed air from the surface to balance the pressure of the surrounding water.
Below: Piccard's bathyscaphe *Trieste* descended almost 7 miles into the Pacific in 1960.





Dogs are useful to men as guards and guides, and even as draught animals. Here a husky dog team is trained for work with the British Antarctic Survey. Huskies have always been a reliable means of transport in polar conditions.

office buildings and shops. Government buildings surround the vast square called Medan Merdeka (Freedom Place). They include the palace of the President of Indonesia. Djakarta also has several universities.

Djakarta's manufactures include iron, cloth, soap, leather and machinery. Its nearby port of Tandjungpriok handles exports of rubber, tea, tapioca and sisal, and imports of coal and oil. Djakarta has good transport links with other parts of Java. It is a communications centre.

Djakarta was an old port under Muslim rule when the Dutch established a trading post there in the early 1600's. They gained control of the area, and when the old town was destroyed, rebuilt it as *Batavia*. It became the headquarters of the Dutch East India Company, and the seat of the Dutch colonial government.

Dogs are probably the tamest animals used by man. For this reason, the dog is often called 'man's best friend'. Dogs can be trained to help in many tasks, including hunting, herding farm animals, keeping guard, guiding blind people, and pulling sledges or small carts. Dog breeders have developed many *breeds* (distinct types) of dogs—with different characteristics, habits and abilities—to carry out these jobs. But many dogs are kept simply as pets.

Pure-bred dogs—those whose parents were both of the same breed—are divided into various groups, according to their characteristics. Dogs that help men hunt in various ways are classed as *sporting dogs*. This group is itself divided into terriers, hounds and gundogs. *Terriers* were originally bred to hunt vermin, such as rats, that live in the ground. They dug out their prey. They are quite small and lively dogs. Various breeds have long or short hair and varied colourings.

Most *hounds* are larger than terriers. The *Irish wolfhound* is the biggest of all dogs, standing three feet high at the shoulder and reaching a length of five feet excluding the tail. Hounds are the true hunting dogs, following their prey by

Some Famous Breeds of Dogs
Bull Terrier
Basenji
Bloodhound
Springer Spaniel
Alsatian
Irish Wolfhound
Welsh Corgi
Irish (Red) Setter
Scottish Terrier
Saint Bernard
Toy Poodle
Pekingese
Kerry Blue Terrier
Boxer
Labrador Retriever
Collie
Fox Terrier
Cocker Spaniel
Airedale Terrier
Bulldog

Flat-coated Retriever
Great Dane
Greyhound
Basset Hound
Afghan Hound
Pomeranian
Siberian Husky
Skye Terrier
Pyrenean Mountain Dog
Sealyham Terrier
Old English Sheep Dog
Bedlington Terrier
Bullmastiff
Newfoundland
Dachshund
Pointer
Dobermann
Dalmatian
Chihuahua
Chow Chow

either sight or smell. *Bloodhounds, basset hounds, beagles and foxhounds* hunt by scent. *Greyhounds, Afghan hounds* and *whippets* are among those hunting by sight.

The third group of sporting dogs are the *gundogs*, such as *spaniels, setters, retrievers* and *pointers*. They are trained to accompany sportsmen who shoot game birds. They help to locate the game, and bring the shot birds back to their masters.

Other dogs that work for man are classed as *working dogs*. They include various breeds of *sheepdogs;* the *huskies* and *samoyeds,* which pull sledges; the *St Bernard,* famous for its rescue work in mountainous regions; and such guard dogs as the *Alsatian,* or *German shepherd.* There are many other breeds of non-sporting dogs that are kept as pets. They include *toy dogs*, which are the smallest breeds. The tiniest of all is the *Chihuahua*—small enough to sit on a person's hand.

All domestic dogs—in spite of their variety—belong to the same species. And they are closely related to various wild species that make up the dog family. The most closely related are the wolves of Europe, Asia and North America; the coyote of North and Central America; and the jackals of tropical Africa and southern Asia. Foxes, which are slightly less closely related to dogs, live in most parts of the world (see Fox; Wolf).

All members of the dog family are *carnivores* (flesh-eaters). Together with the cat family, they are probably the most successful hunters on earth. Dogs are much better runners than almost all the cats except the cheetah. Like the cats, dogs have strong jaws and sharp teeth—particularly the *canines* (eye-teeth), which are named after them ('canis' is a Latin word meaning 'dog'). The claws of a dog—unlike those of a cat—do not retract (draw in).

Dolphins are mammals that live in the sea. They are related to whales. Dolphins are known for their friendliness to human beings and for their intelligence. They communicate with one another by squeaking, whistling, chattering, and barking.

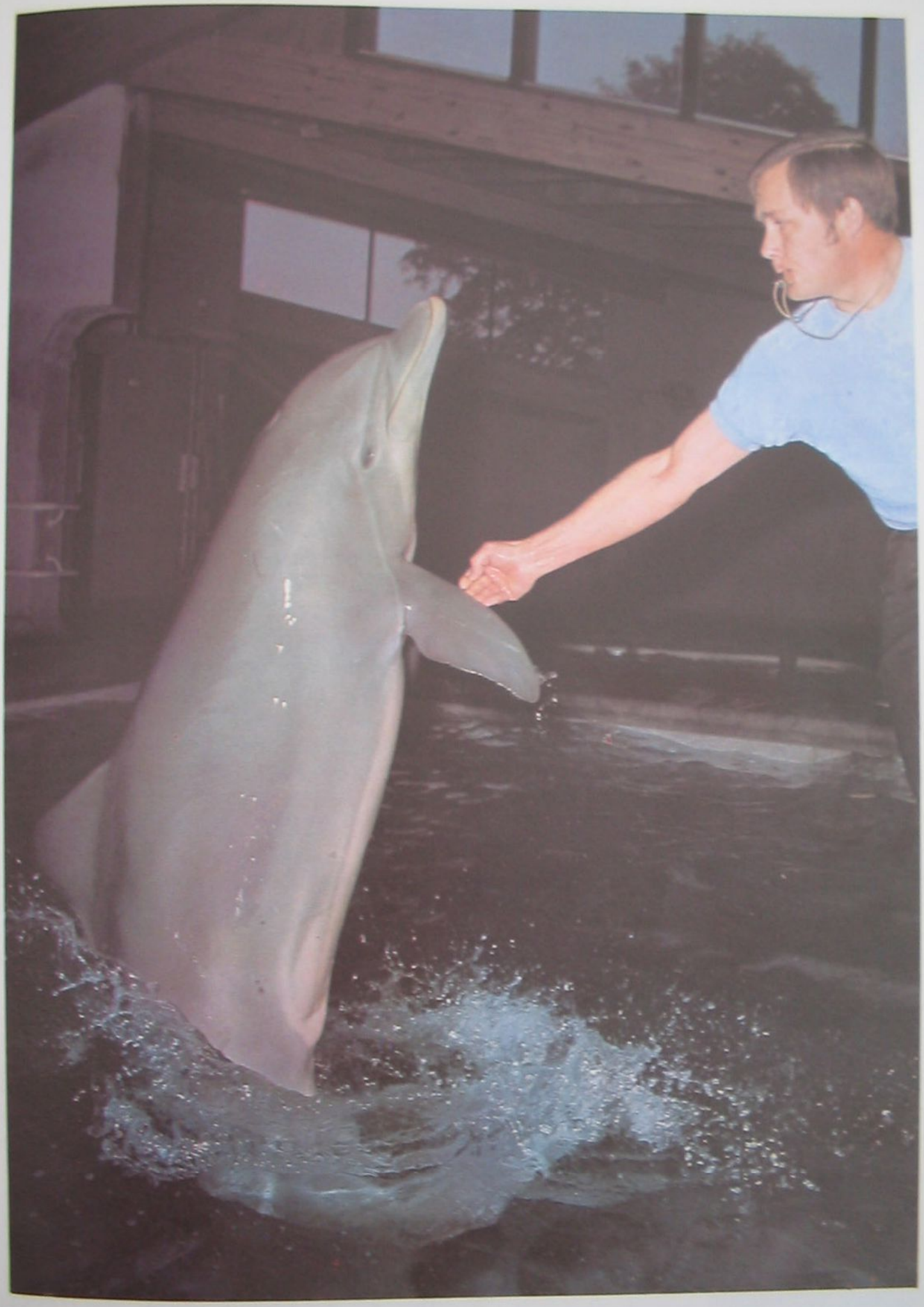
The average length of a dolphin is between 6 and 8 feet, but some are as long as 11 or 12 feet. They have a streamlined shape, a pointed snout rather like a beak and a pair of front flippers. Common dolphins are black on top and white underneath. Bottle-nosed dolphins, a larger species, are grey and have flattened 'beaks'. Dolphins live in most of the temperate waters of the world.

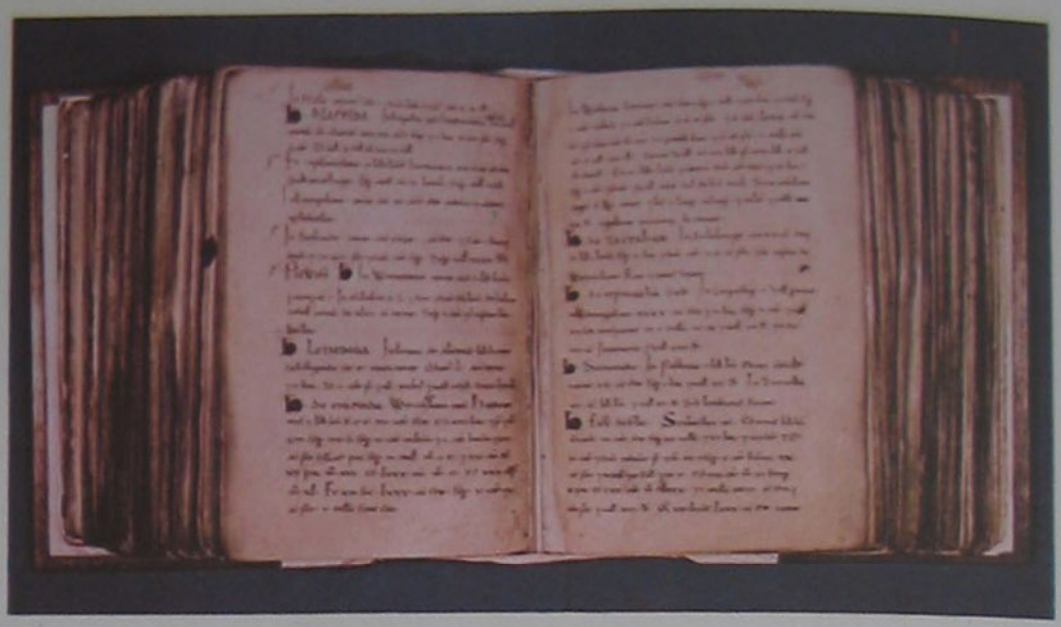
Dolphins have been loved by sailors for thousands of years. Noisy groups of them, circling around a ship, appear to welcome voyagers. Ancient Greek and Roman literature and art contain many references to dolphins in the Mediterranean and Aegean seas. A famous dolphin named Pelorus Jack was observed for 24 years near Pelorus Sound on the northern coast of the South Island of New Zealand. He welcomed any ship sailing in his home waters, and would swim alongside it for miles, later returning home with another ship. Pelorus Jack was last seen in 1912.

Because of their intelligence, dolphins can easily be trained to do tricks. In specially built aquariums dolphins delight audiences with their displays—jumping for fish, leaping through hoops and playing games.

Domesday Book Twenty years after he had conquered England, William I began to measure everyone's wealth so that he could tax the country properly. The survey he ordered is Domesday Book. The Old English Chronicle tells us that he 'had exhaustive discussions about this land and how it was peopled. There was not even one ox, nor one cow, nor one pig

Dolphins leap out of the water at the command of their trainer. The size of the dolphin's brain compared with the size of its body is second only to Man's.





Left: The smaller volume of the Domesday book, which contains the survey of Essex, Suffolk and Norfolk. The other volume deals with the rest of England with the exception of Durham, Northumberland, Cumberland and northern Westmorland which were omitted from the survey. From the information which the two volumes contain the Norman kings knew just how much they could take from their tenants in tax and what services they could claim from their barons.

which escaped notice in his survey'. The results were arranged under counties. In each county the estates of the big landlords were set out in order, beginning with the King's own land and the Church land. Domesday Book is now in the Public Record Office in London. It is written in Latin and most of the words are abbreviated, but the writing is clear. It tells us how much farm land there was in each village and how many ploughs. The watermills are mentioned and the pigs. We can find out how many families lived in each village in the year 1086 and how much the land was worth to the tax collector.

Dominican Republic is an independent country in the West Indies. It has an area of 18,704 square miles, occupying the eastern two-thirds of the island of Hispaniola. Haiti is its neighbour to the west. Most of the Dominican Republic's 4,012,000 inhabitants work in the fields, growing sugar-cane, coffee, cacao and tobacco, all of which are valuable exports. The capital, Santo Domingo, is also the main port.

Christopher Columbus discovered Hispaniola in 1492. Spain, France and later Haiti held the territory of the Dominican Republic. It became independent in 1844. This was followed by years of political upheaval, dictatorship and invasion by the United States on two occasions.

The location map shows the position of the Dominican Republic. It occupies the larger part of the island of Hispaniola, in the Caribbean Sea.

Dorset, a county of south-west England, lies on the English Channel between Hampshire and Devonshire. Its county town is Dorchester, and its population is 361,200.

Dorset is largely a county of chalk downs, heath and fertile valleys. The main rivers are the Stour and the Frome. Farmers raise dairy cattle in the valleys and sheep on the uplands. Portland building stone is extensively quarried. Tourism is important in the coastal resorts of Weymouth, Swanage, Poole and Lyme Regis.

The county is noted for its many monuments and historic buildings. Among the best known are Corfe Castle and Wimborne Minster. Dorset was once part of the Anglo-Saxon kingdom of Wessex.

Thomas Hardy, the poet and author, immortalized the customs and traditions of his native Dorset in his Wessex novels.

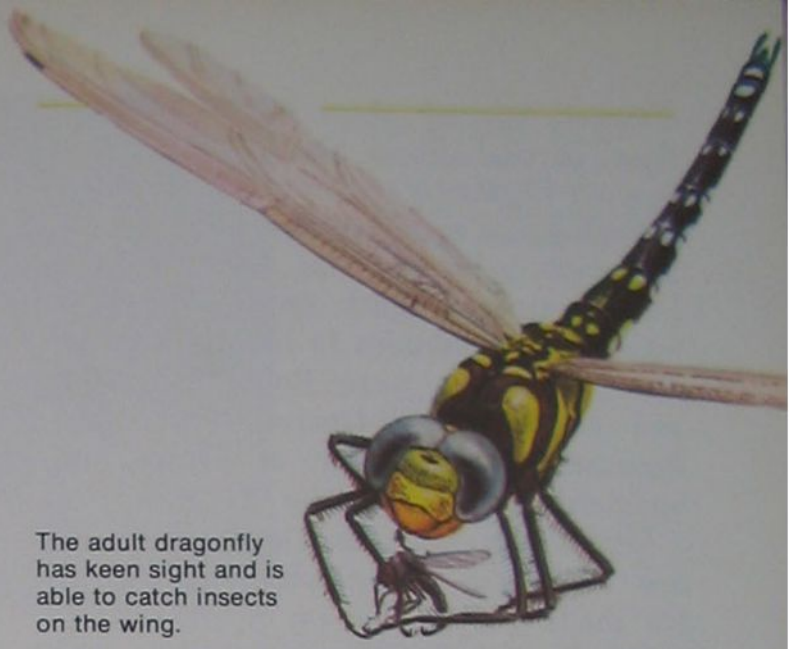
Dostoevsky, Feodor Mikhailovich (1821-1881), was one of Russia's greatest novelists. He wrote about guilt and despair, and other deep human feelings, while at the same time creating dramatic situations and characters. *Crime and Punishment* (1866) and *The Brothers Karamazov* (1880) are two of his masterpieces.

Dostoevsky was born in Moscow, and was a student for several years in a military school. He became a story writer and novelist, and, with his brother, edited a magazine. His writing was much influenced by the tragic events of his life, including his cruel father's murder. At the age of 28, Dostoevsky was condemned to death for belonging to a revolutionary group. At the very moment when he was about to be executed an order arrived reprieving him. Instead he was sent to spend four years in a brutal Siberian prison camp, followed by some years of army service.

Dostoevsky suffered from recurring attacks of epilepsy, and was often in debt. It was only during the latter years of his life that he achieved great fame.

Dragonfly This is an insect with a colourful long slender body and four large gauzy wings. Dragonflies can be seen flitting about over lakes and rivers during the summer. There are two kinds. True dragonflies have back wings slightly broader than the front wings. Damselflies are small dragonflies with four wings of the same size. Dragonflies can move in the air with great manoeuvrability. They are among the fastest insects, and can fly at speeds of up to 60 miles an hour. But they can also change direction so quickly as to deceive the eye, they can hover motionless, and they can even fly backwards.

The dragonfly's huge compound eyes give it keen sight. It easily spots gnats and other insects, darts after them and catches them in mid-air. It holds its six legs to form a 'basket' under its head in which to trap its prey, which is then eaten in flight.



The adult dragonfly has keen sight and is able to catch insects on the wing.

Dragonflies mate in flight, and the female lays her eggs in water. The nymphs have no wings and live in water, breathing through gills. They trap small water animals with a special long, lower lip which has claw-like hooks. After a year or more in water, the nymph climbs up a reed and sheds its skin to emerge as an adult dragonfly.

Drake, Sir Francis (about 1540-1596), was the first Englishman to sail round the world. He also played a leading part in England's great victory over the Spanish Armada (see Armada). He lived during Queen Elizabeth I's reign, which was famous for its sailors. Drake was the most famous English sailor of his time. He

Detail from a portrait of Sir Francis Drake, now hanging in the National Portrait Gallery in London.

attacked Spanish ships for the treasure they carried from South America to Spain. Elizabeth encouraged him, although it was wrong to make such attacks. But such behaviour was not unusual in Drake's time. English sailors looked on Spaniards as enemies to be attacked, because Spaniards were Roman Catholics and sometimes ill-treated Protestants. Because of their fear of Drake, the Spaniards called him the 'Dragon'.

Drake was born in Devonshire, and first captained a ship when he was 22. He made his attacks on Spanish ships mainly in the Caribbean Sea. His most famous voyage began on December 13, 1577, and lasted nearly three years. It began and ended in Plymouth. Drake aimed to sail round the south of South America into the Pacific Ocean and attack the Spanish settlements on the west coast. Drake's ship was called the *Pelican*, but was later renamed the *Golden Hind*. He took four other ships with him. Drake knew that there was a sea passage from the Atlantic to the Pacific Oceans called the Strait of Magellan. When the five ships reached the Pacific, fierce gales blew them hundreds of miles southwards off their course. As a result, Drake discovered Cape Horn.

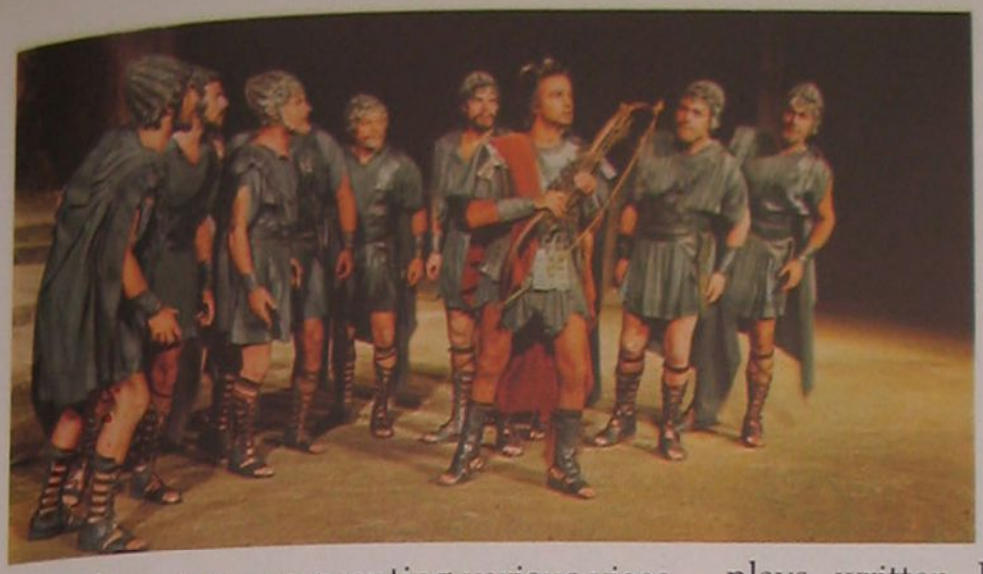
In spite of many difficulties, Drake achieved all he set out to do on his voyage. He raided many Spanish settlements and captured large quantities of gold and silver. He feared the Spaniards would be ready to attack him if he returned by the same route. Instead, he sailed boldly across the Pacific and round the Cape of Good Hope. Drake was given a great reception on his return. Elizabeth knighted him at Deptford on his ship.

The earliest drama in Europe developed from Church ritual. The picture shows a mystery play being performed from the back of a cart in Coventry in the Middle Ages.

Drama as we know it, in the form of stories to be acted, had its beginnings in 5th-century Greece at the yearly festivals for the wine god Dionysus. Poets chosen to compete each prepared several plays. These first plays were *tragedies*, dealing with the hero's sufferings and his conflict with destiny, and often ending in disaster. Aeschylus, Sophocles, and Euripides dominated Greek tragic drama.

Later contests featured *comedies*, which were generally more realistic than tragedies, and were often light and humorous, with a happy ending. Aristophanes was the greatest comic dramatist of that time. The Romans imitated Greek drama and added little to it. But the comedies of Plautus and Terence and the tragedies of Seneca had considerable influence on later dramatic work in Europe.

We know little about early medieval drama until the *miracle* and *mystery* plays. These illustrated Christian stories, and developed from church ritual. In the 13th and 14th centuries English trade guilds began to perform great cycles of these plays, several of which survive. We call them by the names of the towns in whose streets they were performed – York, Wakefield, Chester, and Coventry. In later medieval times came *morality* plays, in which the central figure is confronted



Left: In Ancient Greek tragedies there was always a chorus which commented on the actions of the main characters.

with characters representing various vices and virtues.

In Elizabethan and Jacobean England, drama flourished, culminating in the great plays written by Shakespeare. In this time, too, permanent playhouses were established. Lope de Vega dominated Spanish drama, and in France Corneille

Important Dramatists with Examples of Their Plays:

Aeschylus (Greek, 525-456 B.C.)—the *Oresteia* trilogy
Sophocles (Greek, 496-406 B.C.)—*Antigone*
Euripides (Greek, 480-406 B.C.)—*Alcestis*
Aristophanes (Greek, 488?-380? B.C.)—*The Frogs*
Plautus (Roman, 254?-184 B.C.)—*Amphitruo*
Terence (Roman, 195?-159 B.C.)—*Phormio*
Seneca (Roman, 4? B.C.—A.D. 65)—*Phaedra*
Lope de Vega (Spanish, 1562-1635)—*The Knight of Olmedo*
Christopher Marlowe (English, 1564-93)—*Tamburlaine*
William Shakespeare (English, 1564-1616)—*Hamlet*
Ben Jonson (English, 1572-1637)—*Volpone*
John Fletcher (English, 1579-1625), **Francis Beaumont** (English, 1584-1616)—*The Knight of the Burning Pestle*
John Webster (English, 1580?-1625?)—*The Duchess of Malfi*
Philip Massinger (English, 1583-1640)—*A New Way to Pay Old Debts*
Pedro Calderón de la Barca (Spanish, 1600-81)—*Life is a Dream*
Pierre Corneille (French, 1606-84)—*Le Cid*
Molière (French, 1622-73)—*L'Avare*
John Dryden (English, 1631-1700)—*All For Love*
Sir George Etherege (English, 1634?-91?)—*The Man of Mode*
Jean Racine (French, 1639-99)—*Phèdre*
William Wycherley (English, 1640-1716)—*The Country Wife*
William Congreve (English, 1670-1729)—*The Way of the World*
George Farquhar (Irish, 1678-1707)—*The Beaux' Stratagem*
Carlo Goldoni (Italian, 1707-93)—*Le Bottega di Caffe*
Gotthold Lessing (German, 1729-81)—*Emilia Galotti*
Oliver Goldsmith (Irish, 1730-74)—*She Stoops to Conquer*
Pierre de Beaumarchais (French, 1732-99)—*Le Mariage de Figaro*
Johann von Goethe (German, 1749-1832)—*Faust*
Richard Brinsley Sheridan (Irish, 1751-1816)—*The Rivals*
Friedrich von Schiller (German, 1759-1805)—*Wallenstein*
Victor Hugo (French, 1802-85)—*Ruy Blas*
Henrik Ibsen (Norwegian, 1828-1906)—*Peer Gynt*
August Strindberg (Swedish, 1849-1912)—*Miss Julie*
Oscar Wilde (Irish, 1854-1900)—*The Importance of Being Earnest*
George Bernard Shaw (Anglo-Irish, 1856-1950)—*Saint Joan*
Anton Chekhov (Russian, 1860-1904)—*The Cherry Orchard*
Gerhart Hauptmann (German, 1862-1946)—*The Weavers*
Luigi Pirandello (Italian, 1867-1936)—*Six Characters in Search of an Author*
Maxim Gorki (Russian, 1868-1936)—*The Lower Depths*
Jean Giraudoux (French, 1882-1944)—*Tiger at the Gates*
Eugene O'Neill, (American, 1888-1953)—*Strange Interlude*
T. S. Eliot (American, 1888-1965)—*The Cocktail Party*
Jean Cocteau (French, 1891-1963)—*The Infernal Machine*
Bertolt Brecht (German, 1898-1956)—*The Threepenny Opera*
Federico Garcia Lorca (Spanish, 1898-1936)—*Bodas de Sangre*
Jean-Paul Sartre (French, 1905-)—*The Flies*
Samuel Beckett (Irish, 1906-)—*Waiting for Godot*
Christopher Fry (English, 1907-)—*The Lady's Not For Burning*
Jean Anouilh (French, 1910-)—*The Waltz of the Toreadors*
Tennessee Williams (American, 1911-)—*The Glass Menagerie*
Eugene Ionesco (Rumanian, 1912-)—*Rhinoceros*
Arthur Miller (American, 1915-)—*Death of a Salesman*
Friedrich Dürrenmatt (Swiss, 1921-)—*The Visit*
Ray Lawler (Australian, 1922-)—*Summer of the Seventeenth Doll*
Robert Bolt (English, 1924-)—*A Man For All Seasons*
Edward Albee (American, 1928-)—*Who's Afraid of Virginia Woolf?*
John Osborne (English, 1929-)—*Look Back in Anger*
Harold Pinter (English, 1930-)—*The Caretaker*
John Arden (English, 1930-)—*Sergeant Musgrave's Dance*
Arnold Wesker (English, 1932-)—*Roots*

and Racine were producing their classical tragedies. Molière's comedies greatly influenced the *Comédie Française,* which was founded in 1680 and was later to become the state theatre of France.

The English were deprived of theatre by the Puritans during the Civil War. The reaction against this is evident in the cynical and witty *Restoration comedies* which followed in the late 1600's.

In the late 19th century, romance and melodrama gave way to more realistic drama. The Norwegian Henrik Ibsen developed the first important plays of this kind. One of his most notable followers was George Bernard Shaw, who used his comedies to make social and political comment, which remains an important element in the drama of the 20th century.

Talking Points

*When a play of Shakespeare's is put on the actors usually wear the costume of the period in which the action takes place. This has not always been the case; in the 17th, 18th and 19th centuries the actors often wore contemporary dress. Which do you think is the best method?

*From earliest times drama has often tried to put over a moral point as well as entertain. Discuss what you think is the most important function of drama.

* Films and television plays could be classed as drama. Do you think that the live theatre has any advantage over these other media in presenting drama?

Articles to read

Cinema; Goethe; Literature; Shakespeare; Theatre.

Left: The celebrated late 19th-century actress Ellen Terry

Constant dredging is necessary to keep waterways open to shipping. The bucket dredger (above) is one of the most common dredging vessels.

Dredging The great problem with harbours, canals, rivers and other navigation channels, is that they are constantly filling up with deposits of earth, sand, or silt. To keep them deep enough for shipping the deposits must be removed regularly by dredging.

There are several kinds of dredging vessels, or dredgers. One of the commonest is the *bucket dredger.* This has an endless chain of buckets mounted on a frame that is angled down into the water. The *suction,* or *hydraulic dredger* simply sucks up the silt or sand from the bottom through a pipe. The *grab dredger* has a bucket suspended from a crane which 'grabs' material from the bottom. The *dipper dredger* has a long arm with a shovel on the end which scoops up the material. The dredgers discharge their material in barges moored alongside.

Several of these kinds of dredgers are used to mine ore deposits in the beds of rivers or lakes. Much tin and gold are mined in this way.

Dresden (population 468,000) is a city on the River Elbe in East Germany. It has been a centre of art and culture since the 1600's, famous for its museums, theatres, colleges and parks. The city was once one of the most beautiful in Europe, but most of its ornate old buildings were

destroyed during World War II. Dresden is an important manufacturing city where precision instruments, optical equipment, chemicals and cigarettes are made. The ceramics known as 'Dresden china' are not made in Dresden, but in nearby Meissen.

Drought occurs when less rain than normal falls in an area over a long period of time. Droughts are usually worst in the summer, when high temperatures accompany the dry weather. Droughts bring suffering to all living things in the affected area.

Most plants rely on rainfall to live. If they do not get enough they eventually turn brown and die. For this reason, drought ruins farm crops and grass. Farmers and ranchers cannot make a living. They suffer directly from the drying up of wells and other sources of water, and indirectly from not having enough money to live on. Wild animals also suffer as they cannot find water to drink or plants to eat.

Long droughts increase the chances of forest or bush fires. The dead wood becomes dry enough to burst into flames with just a spark, and once a fire has started it spreads rapidly through dry woods and fields.

In treeless areas, dust storms are another danger. Dry, cracked soil can easily become light enough to be blown away by the wind, and so valuable topsoil is lost. Great dust storms can occur, such as happened in the Great Plains region of the United States in the 1930's. The dust blackened the sky and buried low buildings and much of the remaining vegetation. Severe droughts such as this have occurred from time to time in every age. They have forced whole groups of people to leave their homes and search for greener land.

Weather scientists have tried to end droughts by making it rain. They have tried 'seeding' clouds with chemicals, but without much success.

Droving In Australia teams of skilled drovers are needed to move flocks of sheep and herds of cattle from grazing lands to markets, railheads or ports that may be hundreds of miles away. The drovers work on horseback, travelling in the daytime and resting at night. Often their routes lie through remote, dry areas, and they must know where to find water.

Many drugs are derived from plants. Above: The foxglove, from which the drug digitalis comes. Below: A handful of bark from the cinchona tree which is used to make quinine, a cure for malaria.

Drugs The numerous substances such as herbs and chemicals from which medicines are made are called *drugs*. Their use can be very beneficial to man, and the study

of them and their varying effects on the organs and tissues of the human body is an ancient and most important art, or science.

Many years ago the approach to the study of drugs (now called *pharmacology*) was magical and religious. Many ancient books mention the use of weird remedies such as snakeskin, crab's eyes, mosses, and the like, as useful in certain cases of illness. We now know that many such ideas were mistaken. They were based on the idea of sympathetic magic, which associates certain ideas without any precise knowledge, such as claiming that eating the heart of a lion will make a man strong. On the other hand, the use of tree moss to treat wounds, for instance, is not unlike the modern discovery of penicillin, in which moulds were found to have germ-killing properties.

Herbs were usually the source of most ancient drugs such as foxglove, benzoin, camphor, myrrh and musk, cinchona (from which quinine is made), and coca, or cocaine, which can deaden pain. The first synthetic drug was chloral, made in 1869. Since its discovery, man has learnt to make many complex and diversified substances with a variety of effects on the body. Under the right conditions, and in the correct amounts, these drugs can cure many illnesses. Used otherwise, they can be very dangerous.

Formerly, an apothecary or chemist mixed herbs into medicines, made pills, and ground various compounds with a pestle and mortar. Now, large factories employing many skilled chemists manufacture large quantities of drugs under hygienic conditions by the use of machinery. And millions of pounds are spent on research and the testing of drugs.

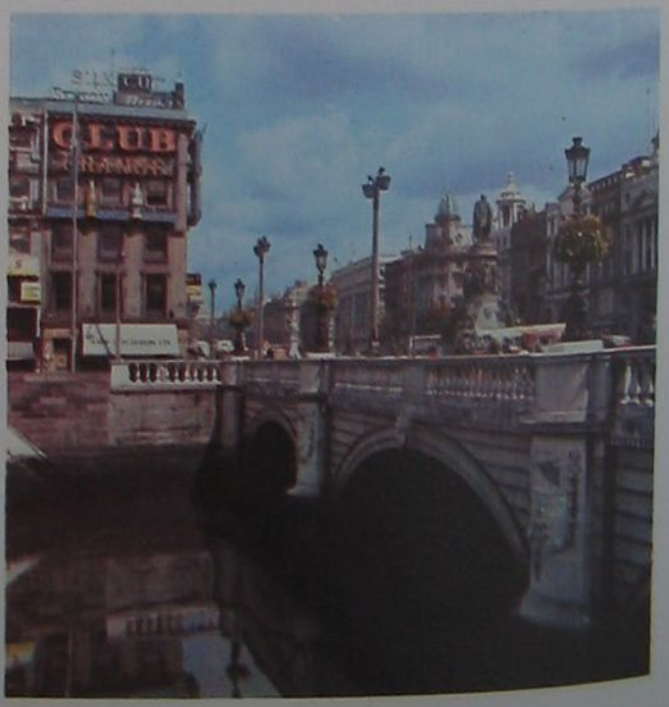
Dry-cleaning is a method of cleaning fabrics with chemical solvents instead of soap and water. Many of the solvents used are derivatives of petroleum. Their fumes are dangerous to breathe and they may catch fire easily. Some safer synthetic chemicals have also been developed.

In a dry-cleaning establishment, the clothes to be cleaned are usually treated first for stains. Then they are placed in the dry-cleaning machine with the cleaning fluid or solvent, and tumbled slowly for up to half an hour. After a rinse in clean fluid, the clothes are spun round rapidly to extract the fluid, and are finally fluffed in hot air. Any stains remaining are removed by hand and the clothes are then steam pressed before going back to the customer. In many cities, self-service, coin-operated dry-cleaning machines in launderettes are popular.

Dry-cleaning has several advantages over ordinary laundering. Cleaning fluids can dissolve certain stains (especially oil and grease) which soap and detergents cannot remove. The process can also be used on delicate or expensive fabrics without harming them, and on those whose colours might run in water.

Dublin (pop. 568,772) is a city, a county borough, and the county town of Co. Dublin. It is also the capital of the Republic of Ireland. The city is situated on the east coast at the mouth of the River Liffey facing the Irish Sea. It is the seat of government, the meeting place of the Dail

O'Connell Bridge crosses the River Liffey in the centre of Dublin.



or National Parliament (Oireachtas) of Ireland. The city is an administrative and distributing centre, and except for the largest brewery in the world has few large industries. Among public buildings are the Roman Catholic Pro-Cathedral and two Church of Ireland cathedrals, the Old Parliament House, and two universities.

Duck family The duck family includes ducks, swans and geese. They are all swimming birds with fairly short legs and webbed front toes. Most of them feed in fresh water, but sometimes they are seen in salt water, and occasionally they feed on land.

There are several kinds of duck. Shelducks resemble geese, and nest in holes. Some of them are so large that they are even called geese, such as the Egyptian goose and the kelp goose. Diving ducks, such as the tufted duck, dive for their food and paddle along the surface of the water before taking off in flight. Surface-feeding ducks, such as the mallard, up-end into the water to feed. They spring off the surface to fly. Sawbills, such as the goosander, have slim, saw-edged beaks. Many have crests, and resemble divers more than ducks.

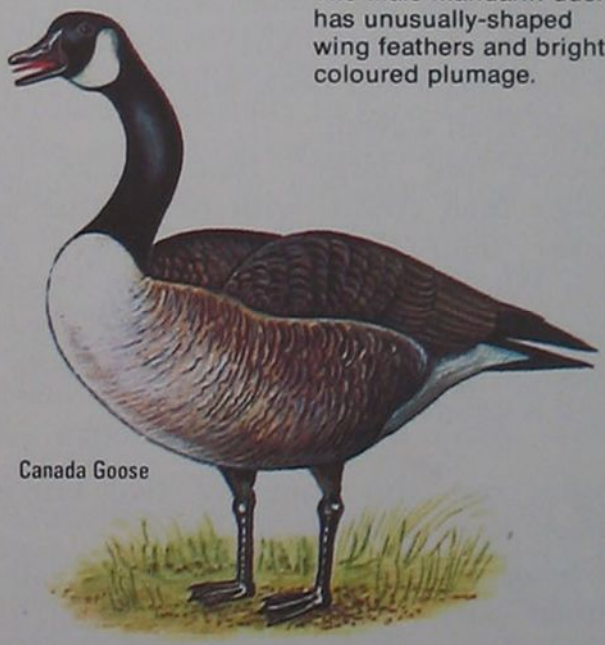
Swans are the largest birds of the group, with long, slender necks that are longer than their bodies. There are six species of swan living in various parts of the world. Three kinds live in the northern hemisphere, and are snowy white. The other three live in the southern hemisphere. A male swan is called a *cob*, and a female a *pen*. The young swans are called *cygnets*.

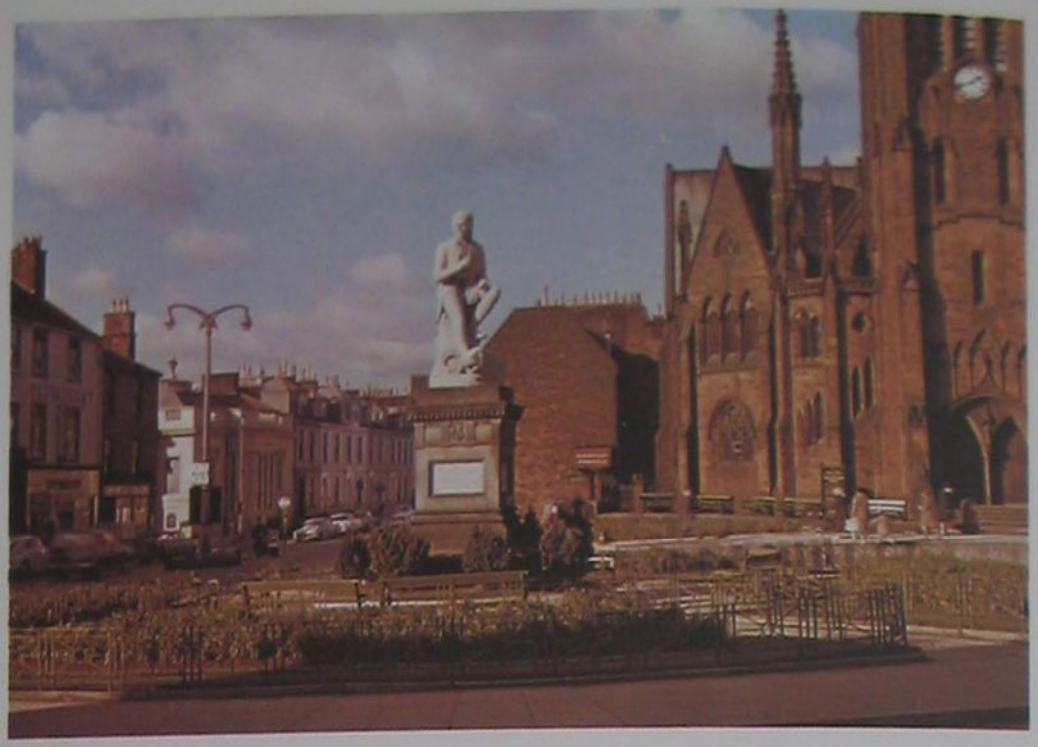
The mute swan lives in Europe and Asia. It can be distinguished by the prominent knob on the beak.

The whooper swan and Bewick's swan nest in the far north of Asia and Europe. Both species have black and yellow beaks, but Bewick's swans are smaller than whooper swans, and more goose-like.

The black swan lives in Australia and

Some members of the duck family. Swans are the largest birds of the group. They build their nests from mosses and other plants. The gaily coloured teal is the smallest of British ducks. The large Canada goose is a very social bird. When the gander has chosen his mate he will normally remain with her for life. The male Mandarin duck has unusually-shaped wing feathers and brightly coloured plumage.





A statue of Robert Burns, Scotland's national poet, in the centre of Dumfries, the county town of Dumfriesshire. Although Burns was born in Ayrshire, he spent the greater part of his life in Dumfries. First he worked as a farmer, and later as a customs officer.

Tasmania. It has black curly feathers, with white wing tips. The black-necked swan and the coscoraba swan both live in South America. The coscoraba has red feet and a red beak, and is more like a goose than a swan.

Geese are larger than ducks but smaller than swans, with necks that are shorter than their bodies. There are more than 30 kinds of geese in various parts of the world. The word *goose* strictly refers to the female. The male is called a *gander*.

Dumas was the name of two famous French writers, father and son.

Dumas, Alexandre (1802-1870), called 'Dumas père', wrote many thrilling historical plays and novels, of which the best known are *The Three Musketeers* (1844) and *The Count of Monte Cristo* (1845).

Dumas was born in Villers-Cotterêts, and lived for many years in Paris. There he founded the *Théâtre Historique* to stage his popular plays. His literary output was enormous, though many of his stories were written in collaboration with other people. He became rich, but because of reckless spending, died a poor man.

Dumas, Alexandre (1824-1895), called 'Dumas fils', wrote plays about the morals of his day. They were very popular at the time. One of them, *The Lady of the Camellias*, provided the story for Puccini's opera *La Traviata*.

Dumfriesshire, a county of south-western Scotland, borders England, and has a 21-mile coastline on the Solway Firth. Its county town is the port and royal borough of Dumfries, and its population is 88,000.

Dumfriesshire is a hilly county that is drained by the Annan, Nith and Esk rivers. Farming is the main occupation. Cattle and sheep are raised in the uplands, and some oats and root crops are grown in the dales. There are also some manufacturing industries, particularly hosiery and tweed. The other main towns, besides Dumfries, are Annan and Moffat. Gretna Green, a village on the border with England, was once famous as a place where runaway English couples could be married quickly, usually by the village blacksmith. Dumfries is famous as the place where Robert Burns, Scotland's national poet, spent the greater part of his life.

Dunbartonshire, a mountainous county in western Scotland, is almost entirely surrounded by water. It lies between Loch

A view of Dunedin, New Zealand, looking down Stuart Street towards Port Chalmers. Dunedin was first settled by the Anderson family in 1845. The settlement grew quickly. During the gold rush of the 1860's, the population grew from 12,000 to over 60,000. At this time Dunedin was the largest town in New Zealand and the chief port.

Lomond in the east, the Clyde in the south, and Loch Long in the west. There is also a small detached part of the county between Stirlingshire and Lanarkshire. The county town is Dumbarton, and the population is 237,500.

The spectacular highland scenery of Dunbartonshire attracts many tourists. But the land in the detached region is lower. There, coal is mined near Kirkintilloch. In the Vale of Leven, the principal industries are dyeing, bleaching and textile printing. Shipbuilding is important along the northern bank of the Clyde, and there the chief industrial towns are Dumbarton, Clydebank, and Helensburgh.

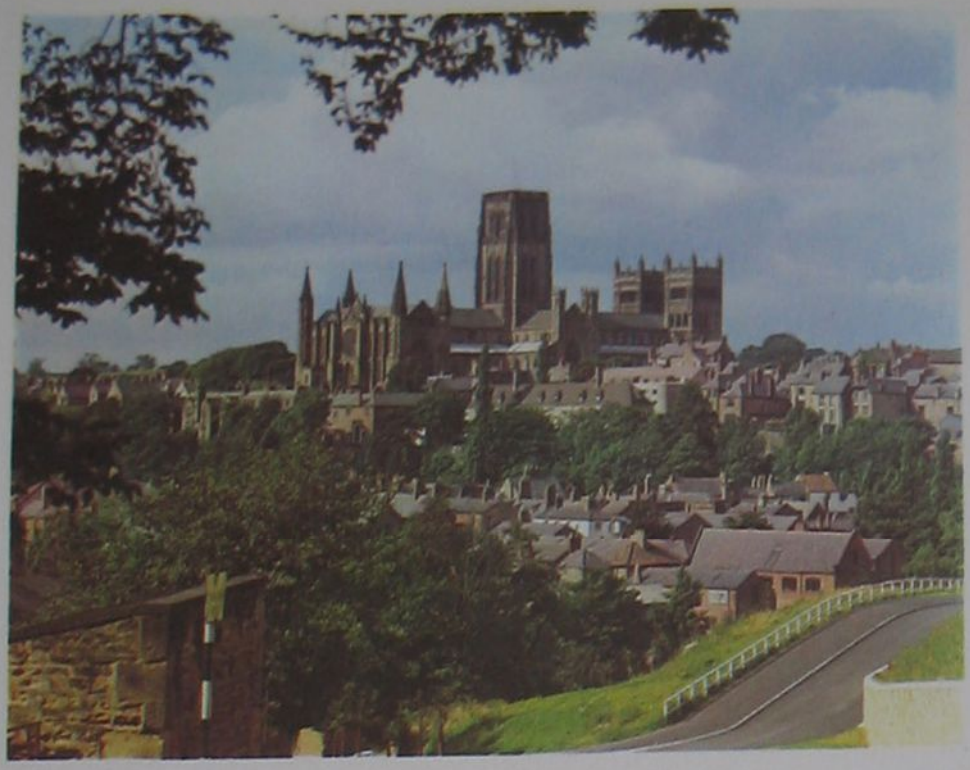
Dunedin, on the south-eastern coast of South Island, is New Zealand's fourth largest city. Many of its inhabitants are of Scottish descent, and keep alive Scottish customs and traditions. Dunedin is the capital of Otago province, and has a population of over 110,000.

Dunedin is laid out in the shape of an octagon. Surrounding the city is a belt of preserved hilly woodland. Dunedin has good schools, a museum and libraries. It also has a university, the University of Otago, which was founded in 1869 and is the oldest university in New Zealand.

The city is a market for agricultural products, and a manufacturing centre where processed foods, textiles, chemicals, furniture, electrical goods, and farm machines are produced. With Port Chalmers, 8 miles north, it forms the Port of Otago. The port has a large import trade, and exports wool, frozen meat, cheese and fruit.

Dunedin was founded by settlers from Edinburgh, in Scotland, who arrived between 1848 and 1852. Dunedin is an old Gaelic name for Edinburgh.

Durban is a port in Natal Province, in the Republic of South Africa. Its warm climate and fine beaches on the Indian Ocean make it a popular winter resort area. But it is also the country's chief port for freight cargo and a leading manufacturing centre. Its population is 660,000. Durban is known for its many parks and gardens, including botanic and zoological gardens. It has fine modern buildings. Part of the University of Natal is there.



A fine Norman cathedral dominates the county town of Durham. The town, which is almost surrounded by the river Wear, occupies a natural defensive position and grew up as a refuge against the raids of the Vikings in the 9th century.

Durban's harbour, once blocked by a sand bar, was dredged in 1887 so that it could be used by large vessels. Today the city's modern docks handle many cargoes including manganese, coal, chrome ore, maize, fruit, sugar, and wool. Durban's industries include shipbuilding, oil refining, the assembly of motor cars, and the manufacture of textiles, furniture and fertilizers.

Durban was known as Port Natal when first settled by the British in 1824. It was later renamed after Sir Benjamin D'Urban, governor of Cape Colony.

Durham, a county in the north-east of England, lies between Northumberland and Yorkshire, and borders the North Sea on the east. Its county town is Durham, and its population is 1,408,103.

The land rises as it approaches the crest of the Pennines, towards the west. To the east, it slopes down towards a fertile coastal plain. The western slopes provide pasture for sheep. But it is the rich coalfield underlying the eastern part of the county that has made Durham one of the most important manufacturing regions in the United Kingdom. Iron and steel manufacture, shipbuilding, and chemical works have led to the growth of such industrial centres as Gateshead, South Shields, Jarrow, West Hartlepool, Sunderland, Stockton on Tees, and Darlington.

Dust Bowl During the 1930's in the United States, the vast central region of the country, known as the Great Plains, was hit by a severe drought. This caused the top-soil to become so dry that it blew away in huge dust storms. This region became known as the Dust Bowl.

During the Dust Bowl era, people in Colorado, New Mexico, Kansas, Texas, and Oklahoma (the states mainly affected) endured great hardships. Crops failed, pastures were destroyed, people lost their homes and jobs and many of them migrated to California. The novelist John Steinbeck wrote compassionately about the sufferings of this period in a well-known book called *The Grapes of Wrath.*

In part, the Dust Bowl was caused by previous farming mistakes. For example, some farmers had weakened the land by using poor methods of ploughing and planting, or by burning off the top growth. Others had allowed their livestock to over-graze the land. Without grass roots

A group of Dyak tribesmen from Borneo. The word 'Dyak' comes from a Malay word meaning 'man of the interior.' In the past, the Dyaks practised cannibalism and head-hunting, but in modern times many of them have become Christians. Dyaks work on plantations or in factories but they have retained many of their ancient tribal customs.

and other plants to bind it, the topsoil was ready to be blown away.

In the late 1930's and early 1940's, the Dust Bowl received a reasonable amount of rain. The farmers had learned a lesson. To overcome their problems, they planted 'windbreaks' of trees at right-angles to the direction of the prevailing wind. They planted grass and other plants to bind the soil, and ploughed along the contours of the land. But in the 1950's and again in the 1960's, drought and high wind caused the top soil to start blowing away again.

It is estimated that just three counties in Texas lost 50 million tons of soil in one day in 1935.

Dwarfs and giants. Dwarfs are animals or plants that are much smaller than normal, whereas giants are much larger than normal. In man either condition may be hereditary, or may be caused by the improper functioning of a gland. The *pituitary gland*, which regulates the body's growth, can cause both dwarfism (through under-activity) and giantism (through over-activity). The *thyroid gland* also affects growth. If it fails to secrete the right amount of thyroid hormone in childhood, the child's physical and mental development are both retarded. This condition is known as *cretinism*. Cretins are usually deformed and retarded as well as stunted in growth.

Animals or plants may be specially bred for size—for example, 'toy' dogs or giant show plants. Poor growing conditions, such as high altitudes or extreme cold, can cause plants to be naturally dwarfed. The Japanese prune and train trees purposely to create miniatures, called *bonsai trees*.

Dyaks are a people who live in Borneo. They belong to the Mongoloid race, and are generally brown or bronze skinned, small in build, and physically agile. There are several Dyak tribes, which differ in language, in customs and in other ways.

A Tunisian woman wrings out newly dyed wool. The vast majority of dyes used today are of the aniline variety derived from coal-tar. In some developing countries, however, the traditional natural dyes are still used. They are obtained from plants and animals. The imperial purple dye, which the Roman emperors used, came from a Mediterranean shellfish.

In all more than one million Dyaks live on the island.

Many tribes live in the forested interior of Borneo. Land Dyaks, as these tribes are known, are cut off from civilization and still follow their primitive way of life. They include one *nomadic* (wandering) tribe. Other tribes, known as Sea Dyaks, live along the northern coast of Sarawak and Sabah. Over the centuries, many of them have intermarried with the Malays and accepted the Muslim religion.

The Land Dyaks live close to the rivers. They have strong family ties and live together in communal *longhouses* built on stilts. Each related family has its own room, which opens on to a central hall. A chief heads the house.

Dyak farmers grow mostly rice. They also cultivate maize, cassava and sugar-cane. Hunters and fishermen kill their prey with spears, and with blowguns that fire poisoned darts. The Dyaks were once warlike. Tribes fought each other and the winners collected their victims' heads in the belief that they would gain strength from them.

Most Dyaks follow a primitive religion based on the worship of animal and ancestral spirits. They perform ceremonies with dancing, masks and costumes. Dyaks often decorate their bodies with metal ornaments, feathers and tattoos. The Sea Dyaks wear clothes made of multicoloured woven or printed materials.

Dyes The plant and animal fibres we use to make our textiles have little natural colour. They are mostly off-white or brownish-yellow. We therefore have to add colour to them in the form of a dye.

Man has dyed cloth for thousands of years with colouring matter taken from plants, such as madder and indigo, and animals, such as cochineal. But the range of natural dyes is very limited.

In 1856, however, the English chemist William Perkin made a mauve dye from aniline, a substance in coal tar. It was the first *synthetic* (man-made) dye. Since then literally thousands of coal-tar, or aniline dyes have been discovered in all the colours of the rainbow. They are cheaper and more brilliant than natural

Golden eagles are birds of prey. They are strong enough to carry off lambs and young deer.

dyes. Also they are *fast*, or resistant to washing and to sunlight.

Every kind of fibre requires a different dyeing treatment. Sometimes a chemical substance called a *mordant* may have to be applied before the dye will act.

The main methods of colouring fabrics by dyes are dyeing and printing. Dyeing colours the fabric throughout in the same colour. It involves soaking the fabric in a hot dye solution. Printing gives the fabric a coloured pattern. The dye is applied to the fabric in the form of a paste by engraved rollers or through a silk-screen.

E

Eagles are large, powerful birds of prey that belong to the hawk family. They are found in all parts of the world, and vary greatly in size and looks. They all have large, strong, hooked beaks, and powerful *talons* (claws). They differ from other

The eagle has been a heraldic symbol since early times. The Roman Legions carried statues of golden eagles on top of their standards. The eagle was also the symbol of the Imperial Austrian and Russian families, and the bald eagle is the national bird of the United States.

hawks in their large heads, very deep beaks, long wings with broad tips, and soaring flight. They build their nests (called *eyries*) in tall trees and on cliff tops. The female bird is usually slightly larger than the male.

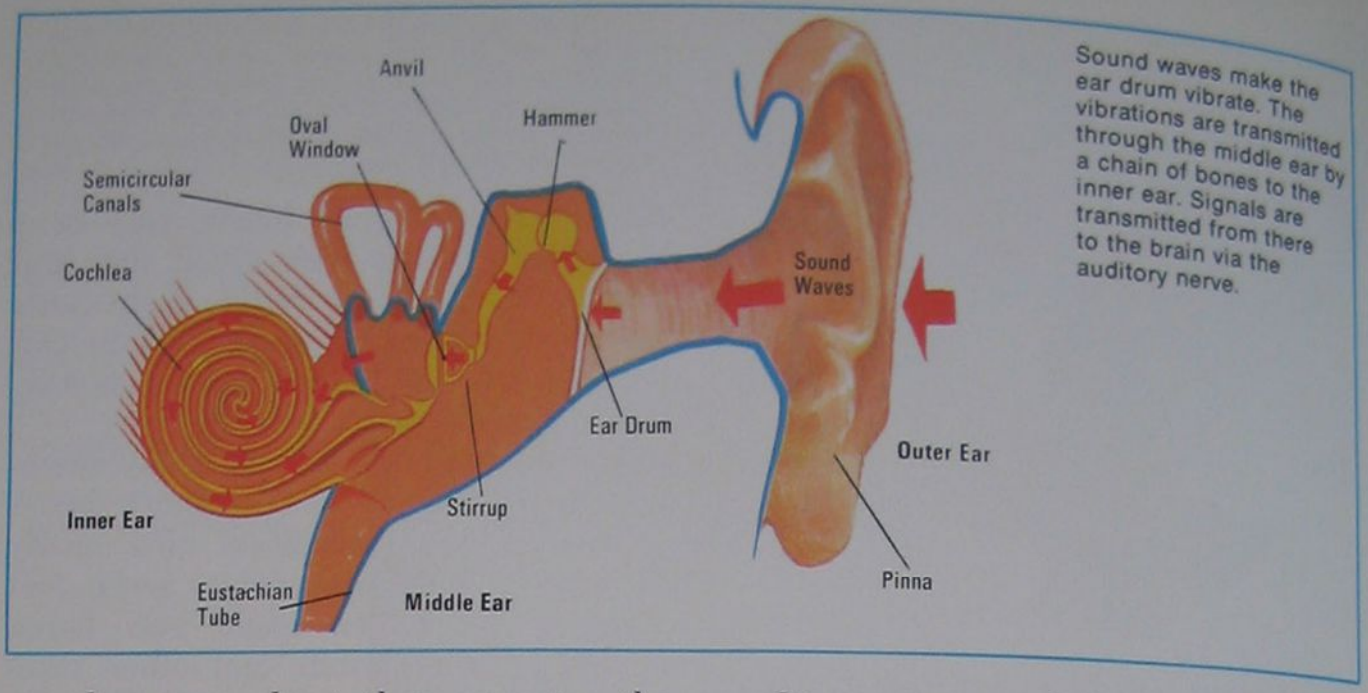
The golden eagle lives in lonely mountainous regions of the northern hemisphere. It is a magnificant bird, nearly three feet long, with wings seven feet across. The golden eagle eats hares, lambs, grouse, rabbits and other small mammals. It will even carry off fawns. It often builds on to an old nest, and these eventually may grow to six or seven feet across.

The harpy eagle is found in the forests of South and Central America. It is a large powerful bird that feeds on wild pigs, sloths, and wild turkeys. This bird is brownish black, with white underparts. It is named after the winged monsters of ancient legends called *harpies*.

The bald eagle lives in temperate parts of North America. It is a greyish bird, with white head, neck and tail. The female may have a wing span of eight feet. Apart from the usual diet of small mammals, the bald eagle eats a lot of fish. It is the national bird of the United States.

Ear Our ears are sense organs that enable us not only to hear, but also to keep our balance. The ear has three distinct parts: the *outer ear*, the *middle ear* and the *inner ear*. The nerve endings that transmit the sensation of sound to the brain are in the inner ear. Sound consists of very rapid vibrations, and the function of the outer and middle ears is simply to transmit these vibrations to the inner ear.

The outer ear consists of the ear-flap, or *pinna*, and the ear passage. At the end of the passage is the *eardrum*, a thin



Sound waves make the ear drum vibrate. The vibrations are transmitted through the middle ear by a chain of bones to the inner ear. Signals are transmitted from there to the brain via the auditory nerve.

membrane or sheet that separates the outer ear from the middle ear. The middle ear is filled with air, and is separated from the inner ear by another membrane, the *oval window*. A chain of three tiny bones—the *hammer*, *anvil* and *stirrup*—links the two membranes. When sounds vibrate the eardrum, the chain of bones transmits the vibrations across the middle ear and passes them to the oval window.

A passage called the *eustachian tube* connects the middle ear with the back of the throat. It ensures that there is equal air pressure on either side of the eardrum. Swallowing or yawning opens the tube and allows air into the middle ear, so helping to 'unbung' ears.

The inner ear consists of a complicated system of canals filled with liquid. The part concerned with hearing is called the *cochlea*. It consists of a long coiled tube like a snail's shell with a sensitive membrane on which there are tiny hairs. The hairs are connected to the *auditory* (hearing) *nerve*. Vibrations transmitted from the outer ear make the oval window vibrate, setting up waves in the liquid in the cochlea. The waves disturb the hairs on the sensitive membrane. Different parts of the membrane are sensitive to different vibrations. As a result, signals are sent to the brain via the auditory nerve, and the brain interprets them as sounds.

Another part of the inner ear, the three *semicircular canals*, is concerned with balance. The canals also contain liquid and have sensitive hairs. Whenever we change position, the liquid moves, disturbing the hairs. They send signals to the brain about our change in position.

Earp, Wyatt Berry Stapp (1848-1929), was one of the legendary figures of the American West. Many stories, films and television programmes have been based on his career as deputy sheriff and deputy U.S. marshal, as well as on his skill with a gun.

Earp was born in Monmouth, Illinois. He held many jobs before becoming a law enforcement officer in Wichita and Dodge City, Kansas. Later, he signed on with the Wells Fargo Company as armed guard for their shipments of money or gold bullion at Tombstone, Arizona.

There, in 1881, a dramatic gunfight, known as the Battle of the O.K. Corral, took place over the robbery of an $80,000 shipment. Earp and two of his brothers took part in the battle, but no one knows for sure exactly what happened there. Some say the Earps killed the criminals; others say they took part in the robbery themselves.